Volume 48, No. 1 January, 1959

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

SEASON'S GREETINGS

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Long before a spade is turned on any construction job, much of the project has been completed. Weeks, months and even years of surveying, planning and design must be accomplished before actual construction can begin. Wherever men move mountains, mountains of rock, mountains of details or mountains of production problems, engineering genius has paved the way.

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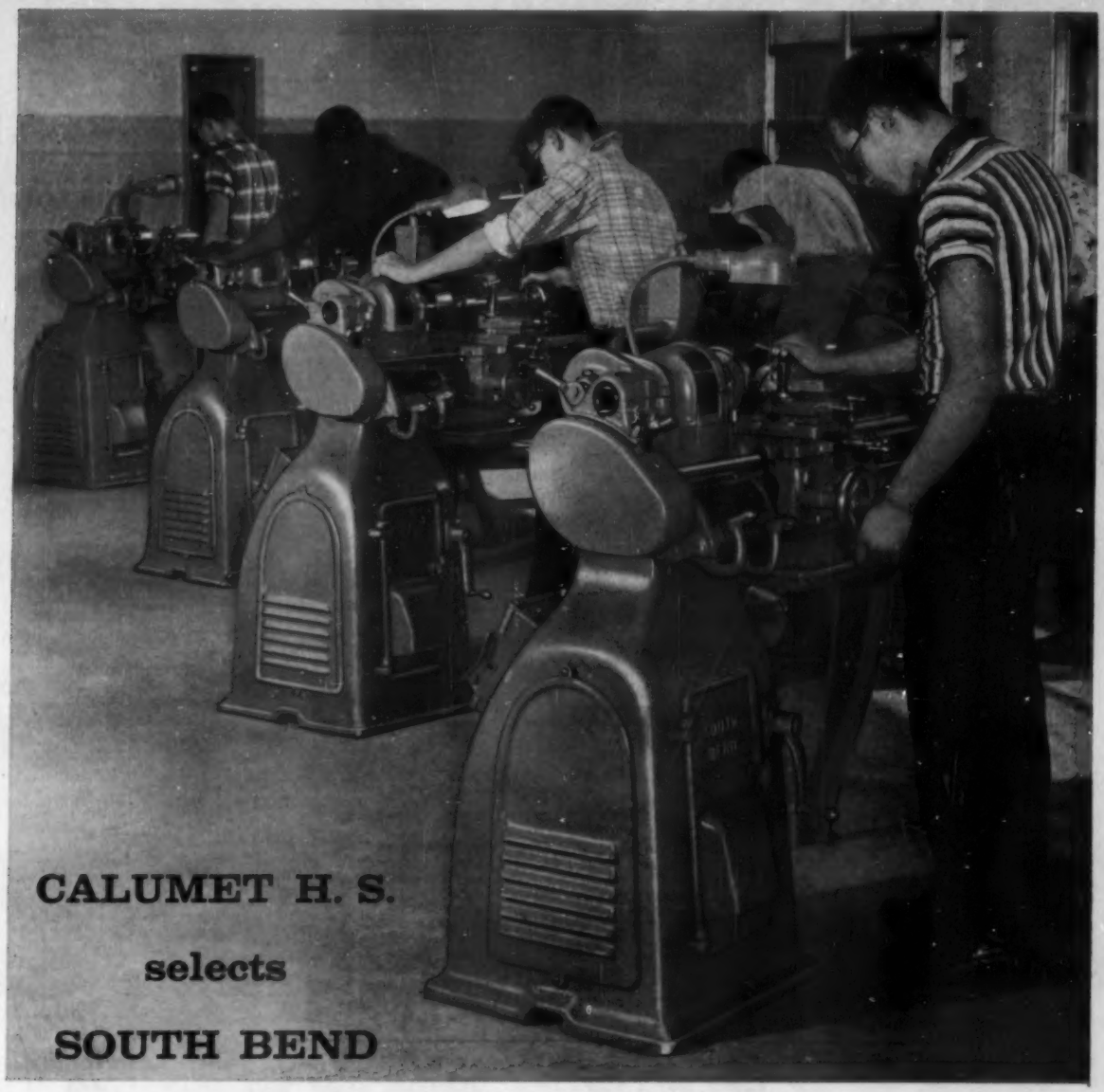

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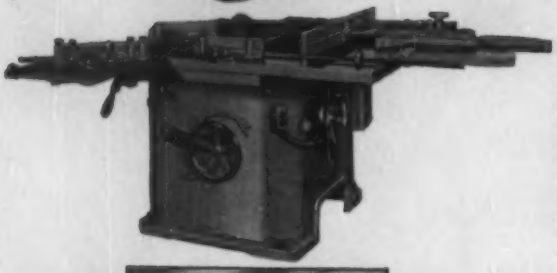

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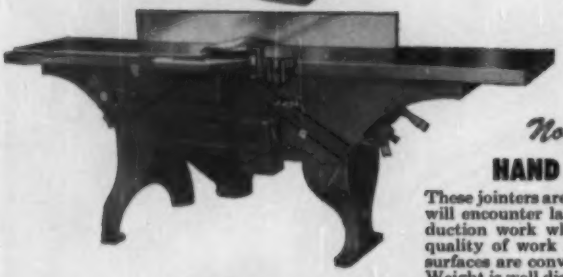

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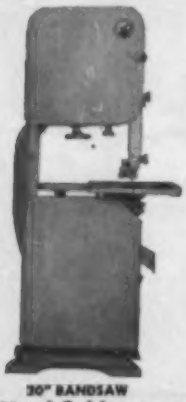

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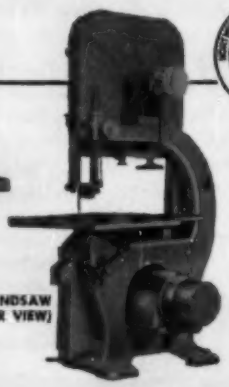

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JANUARY
1959

VOL. 48 NO. 1

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

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This Month's Cover

Shown in the picture on this month's cover is the Linotype machine used in the printing curriculum at the Murrell Dobbins Vocational-Technical School at Philadelphia, Pa.

Ruy Granzow is instructor of this course.

The photograph was sent to us by Benjamin J. Novak, Frankford High School, Philadelphia.

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Association News

COMING CONVENTIONS

Feb. 27–28. Industrial Teachers Conference, at the A. & M. College of Texas, College Station, Tex. Secretary, Leslie V. Hawkins, Texas A. & M. College, College Station, Tex.

Mar. 13–14. California Industrial Education Association, at Stockton Memorial Auditorium, Stockton, Calif.

Mar. 19–20. Tennessee Vocational Association, at Nashville, Tenn. Secretary, W. A. Seeley, 111 E. Cordell Hull Bldg., Nashville 3, Tenn.

Mar. 19–21. Illinois Vocational Association, at Pere Marquette Hotel, Peoria, Ill. Secretary, Orlin D. Trapp, Waukegan Township High School, Waukegan, Ill.

Mar. 27–28. Washington Industrial Arts Association, at Shadle Park High School, Spokane, Wash. Secretary, Carl Schmidt, N. 120 Locust St., Spokane, Wash.

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1958 INDUSTRIAL ARTS CONFERENCE

The 45th meeting of the Industrial Arts Conference was held at Hotel LaSalle at Chicago, Ill., on November 13, 14, and 15, 1958.

The first conference of 1958 was opened by Verne C. Fryklund on Thursday at 9:30 a.m.

The question to be discussed was "What Will Be the Major Developments in Industrial Arts Education in the Next Ten Years."

The panel consisted of H. H. London, J. L. Feirer, and Ralph O. Gallington.

Dr. London pointed out that each subject must offer a unique phase in education. There must be a definite effort to develop some skills, an emphasis on safety, good working habits and attitudes.

Guidance must be exerted since the industrial-arts courses present a good place for technological subjects so useful in this do-it-yourself era. Adult education is needed for the many retired.

Dr. Feirer stated that in 1970 the inhabitants of the United States will have grown to 209 to 211 million; that there will be fewer semiskilled workers, that there will be many new products, more skilled repairmen, and that skilled workers will require more technical knowledge.

All of this means that we must develop more problem-solving courses, more applied science and mathematics, and more language and science courses.

Gallington. Manual training still in use in many places and there are too many school shops that are drab and unattractive. All of this can be altered by men energetic enough to show what can be done about the things that were wrong with the old methods.

Projects when used must be employed in a better way, and we must use improved lecture-demonstration methods. We must also use better instruction and testing methods.

The panel at the two o'clock conference on Thursday consisted of H. Ray Karnes, E. W. Tischendorf, and H. F. Poyzer.

The problem discussed was "Various New Curriculum Patterns That Have Been Developed in Colleges and Universities for the Preparation of Industrial-Arts Teachers."

Mr. Poyzer presented 18 conclusions which he had worked out on this thesis.

Mr. Tischendorf gave a summary of comments which he received to a questionnaire which he had presented to 16 chairmen of industrial-arts teacher education departments.

He advocated that teacher education departments should teach method courses in general shops, to give more practical and theoretical courses on preparation of general shop teachers, reduce the professional courses in departments of education, give more design courses, more sketching, more drawing, more science and/or mathematics courses, place more emphasis on the study of safety.

Mr. Karnes suggests that some of the previous suggestions be carefully evaluated.

Some to be discouraged: The preparation of technicians for industry by industrial-arts teacher education departments, shop work for graduate credit if it has no distinguishing marks of graduate study, accepting the notion that industrial arts should and must be a program for the average and the slow.

Some to be encouraged: Promote the interpretation of the harmony and consistency between the work in the shop and the methods courses, make industrial-arts courses interpret the aspect of our culture, upgrade industrial-arts teacher educators technically, make our shop and laboratory courses more problem solving and industrial and technological, provide experiences in designing

(Continued on page 6A)

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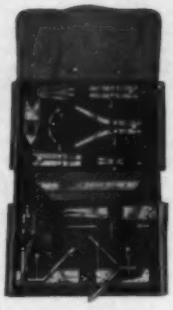

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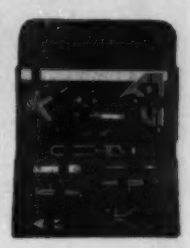

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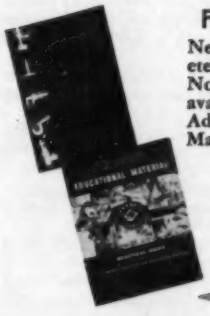

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1958 Industrial Arts Conference

(Continued from page 4A)

projects, but also in making jigs, tools, and fixtures for producing them.

The general chairman of the conference at the Friday morning nine o'clock session was R. M. Stombaugh.

The question to be discussed was "How Important Is It in 1958 Whether We Call Industrial Arts General Education or Vocational Education." Most important is: how useful is it and how is it taught?

The panel chairman was to have been D. F. Barich who could not get away to attend the conference because of the press of work.

Mr. Stombaugh took Mr. Barich's place and R. H. Larson and Asbury Smith assisted in placing the problem before the conference.

Mr. Smith. Vocational education has its roots in the oldest type of education, the apprenticeship training used in the middle ages.

Industrial-arts stems from the manual training movement. Industrial arts is cultural while vocational education is concerned with skills, technical knowledge, and vocational attitudes. Industrial arts has guidance values beyond that of vocational guidance.

Mr. Larson gave a very fine history of industrial arts as general education by presenting the thoughts of the older philosophers who were dissatisfied by the educational systems of their times and tried to bring about a change. He quoted from Luther, Mulcaster, Petty, Lock, Comenius, and Rousseau. He also quoted from Mays, Dewey, Butler, Griffith, Struck, Schweickhard, Bennett, Christy, Fern, Wilber, MacDonald, Monroe, Yaeger, Baysinger, Micheels, Lewis, Stiles, Schmitt, and Hippaka. Mr. Barich's paper was presented by Stombaugh.

The Individual's usé of his shopwork in the last end determines whether our work for him is industrial arts or vocational education.

At the Friday afternoon session Dr. Fryklund served as the general chairman in the place of W. D. Stoner who was absent.

The topic for this session was "How Can Our Programs of Student Teaching Be Better Carried Out or Improved to Better Meet the Needs of the Individuals Entering Our Profession."

John A. Jarvis was the panel chairman, and Walter Nalbach and Otho L. Barnett were the other panel members.

Mr. Jarvis. Most of the 48 states require 1 to 2 credit hours or 1 to 15 clock hours for those who want to do student teaching. A grade average above *C* is generally required. Then there is often required the approval by a department head and a formal application by the prospective student teacher.

Mr. Nalbach. New teachers are frequently confronted by a lack of tools and equipment, materials, and an oversupply of students. Many of the new teachers do not want to attend teacher meetings. They seem to be best for teaching in unit shops. When started out teaching in a general shop they frequently revert back to a unit shop subject.

Off campus teaching is frequently not successful. In such cases students are often puzzled. Therefore, much supervision is needed.

In future it will be quite likely that these teachers will serve a year's internship.

Mr. Barnett. Present status of student teaching practices vary greatly in length from several hours to as many as 18 weeks or more. Schools use the all-day student teaching situation more and more. Most students now are getting their student teaching during the last semester or quarter of undergraduate work.

Colleges should provide good supervisory facilities, and grant staff time for supervision and grant transportation and expense money for off campus travel.

The chairman of the Saturday morning panel session was Sylvan A. Yager, with L. L. Gore and Harry Gunderson assisting.

The subject for discussion was "Characteristics of a Technological Society Which Should Be Reflected in a Program of Industrial Arts."

Mr. Yager. Fifty per cent of our people will work at something that will require training of some kind. Our schools offered aviation courses fifty years after flying started. The Dewey system included interest and that diminished our emphasis on skill.

The automobile (Fords) came into our schools 25 years after the automobile was invented. We are beyond the age when a limited experience in our school shop will fill the bill. We must take care of our bright students as well as the cast-offs. We must give more emphasis on craftsmanship, develop a better understanding of manufacturing and production techniques, also a closer co-ordination between industrial arts, mathematics, physical, and social science.

Mr. Gunderson. The rural worker does not care about a general welding course. He wants to know what he must do at a given moment, such as brazing, welding plowshares, repairing farm machinery, build farm buildings like barns, etc.

The following new members were elected to the Industrial Arts Conference: Dr. Dempsey Reid, industrial arts department, Macomb, Ill.; Orin R. Robinson, state supervisor of industrial arts, Frankfort, Ky.; E. L. Barnhart, head of industrial arts department, Emporia State Teachers College, Emporia, Kans.; Ira H. Johnson, head of

(Continued on page 8A)

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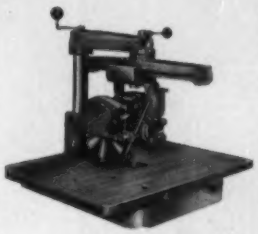

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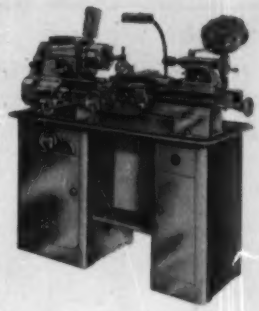

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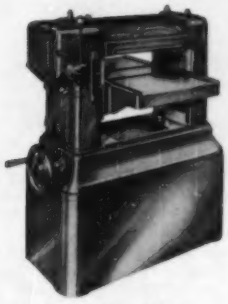

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ASSOCIATION NEWS

(Continued from page 6A)

industrial-arts department at Mankato State Teachers College, Mankato, Minn.

G. Harold Silvius, who was unable to attend this year, mailed a paper to the conference on "The Program of Industrial Education in the United States by Operational Levels."

The next meeting (46th Annual Meeting) will be held at Hotel LaSalle, Chicago, Ill., on November 12, 13, and 14, 1959.

NEW ENGLAND INDUSTRIAL ARTS TEACHERS ASSOCIATION

The 21st Annual Convention of the New England Industrial Arts Teachers Association was held at the Eastland Hotel, Portland, Me., on November 14 and 15, 1958. The theme of the meeting was "Industrial Arts and the Total Curriculum."

There was an informal get together at Headquarters Room, and an Executive Board Meeting on Thursday evening.

Friday's activities included registration during the morning, viewing commercial exhibits, trips and tours by bus from the hotel to: Maine Vocational Technical Institute, Central Maine Power Company, Burnham and Morrill Canning Company, and a trip to Gorham State Teachers College, Industrial Arts Department.

At 2:30 p.m., a business meeting and general session was held. The topic for discussion covered the status of industrial arts in each state, and reports were made by state vice-presidents.

Group discussions were conducted with Dr. John Mitchell acting as chairman. Following the state caucuses, the annual banquet was held at the Eastland Hotel Ballroom, with President Michael Russo, presiding. Toastmaster was J. Weston Walch, publisher.

The principal speaker of the evening was Dr. G. Harold Silvius, professor and chairman of the industrial education department, Wayne State University, Detroit, Mich.

The Saturday program included the commercial exhibits, a general business meeting, and luncheon. A summary of the reports of round-table discussions was presented by Dr. John Mitchell, chairman, industrial-arts department, Gorham State Teachers College, Gorham, Me.

The discussion groups held from 3:30 to 5:30 p.m., on Friday included Group I — General Shop; Group II — General Woodworking; Group III — Planning and Drafting; Group IV — General Metals; Group V — Graphic Arts; and Group VI — Power Mechanics and Electricity.

Greetings and Distribution of the Ship's Cargo took place before adjournment.

EPSILON PI TAU, NU CHAPTER

The annual initiation of candidates for Epsilon Pi Tau, Nu Chapter, New Brunswick, N. J., was held on the Rutgers University campus on Friday, October 24, 1958.

At the business meeting and dinner program of the fraternity, the following apprentices were accepted: Nicholas L. Altieri, Nelson Beebe, Jr., Walter S. Buist, Eugene Drozdoff, and J. Alfred Seitz.

During the business meeting with Kenneth Charlesworth presiding, George Morgenroth presented his study of the present membership and the quota of new members needed to sustain the organization.

At the dinner arranged by Frederick Porges, social chairman, to honor the initiates, Minor L. Fahrmann, assistant chief engineer, California Oil Company, discussed "The Needs for

(Continued on page 10A)

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ASSOCIATION NEWS

(Continued from page 8A)

Technical Training by Industry." Dr. Burr Coe, program chairman, introduced the speaker.

Dr. Henry Herge, faculty adviser, congratulated the new members of the fraternity and wished them success in carrying out the dictates of the Chapter.

— Charles F. Green, public relations.

ZETA CHAPTER, EPSILON PI TAU

The fall initiation and dinner program of Zeta Chapter, Epsilon Pi Tau Fraternity was held on the campus of Northern Illinois University in DeKalb, Ill., on Saturday, December 6, 1958. The initiation took place in the Industrial Arts Building at 4:00 p.m., and the dinner meeting was held in the DeKalb Junior High School at 6:00 p.m.

Jesse Owens, former Olympic champion, was the speaker at the dinner. Mr. Owens has done work in the industrial-arts field besides his many other outstanding accomplishments.

OREGON INDUSTRIAL ARTS FALL CONFERENCE

The Oregon Industrial Arts Fall Conference was held in Eastern Oregon at Pendleton, on November 7 and 8, 1958.

The 1958–59 officers of the OIAA are: president, Franz Sedlacek, Clackamas High School, Milwaukie; vice-president, Gordon Asbury, McMinnville; secretary-treasurer, Marguerite Hallock, industrial-arts teacher at Silverton, Ore.

CONNECTICUT INDUSTRIAL ARTS ASSOCIATION

On October 24, 1958, the Connecticut Industrial Arts Association held its fall convention at the Three Door Inn, Bridgeport, Conn.

Dr. Harold R. W. Benjamin addressed the luncheon meeting. His topic was "Key Education Issues — A Comparative View."

At the business meeting that followed it was announced that the 26th Annual Spring Conference of the Connecticut Industrial Arts Association would be held at the Teachers College of Connecticut at New Britain on May 1 and 2, 1959.

The cochairmen of the conference are Nicholas Battit, King Philip Drive Junior High School, West Hartford, and Dr. Robert Bateson, professor of vocational education, Teachers College of Connecticut, New Britain.

— David T. Dean, publicity chairman.

SECOND ANNUAL CONFERENCE OF THE K.I.E.A.

The Kentucky Industrial Education Association held its Second Annual Conference at the Kentucky Hotel, in Louisville, on November 7 and 8. The conference was a professional in-service program for industrial arts, vocational industrial and distributive education teachers throughout the Commonwealth.

An outstanding number of 417 persons officially registered during the two day meeting. The success of the K.I.E.A. is further enhanced by the new record of 479 members reported at the close of the conference.

Among the features of this year's conference were ten sectional meetings and two general sessions. The first general session convened Friday evening, with a welcoming address by Dr. Omer Carmichael, superintendent of the Louisville Public Schools. The guest speaker for the evening was Dewey F. Barich, president of the Detroit Institute of Technology. Mr. Barich's topic was "Craftsmanship in Industrial Education."

Other features of interest to the many per-

(Continued on page 14A)

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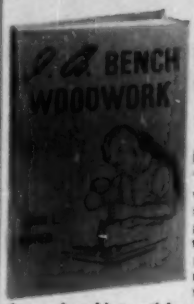

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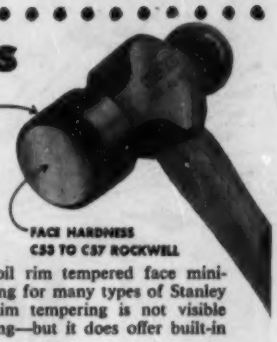

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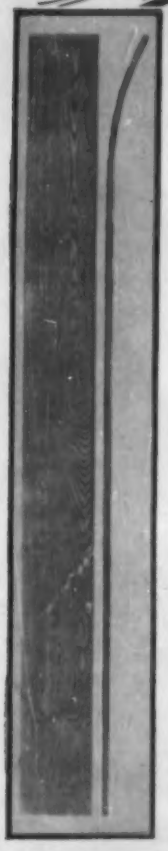

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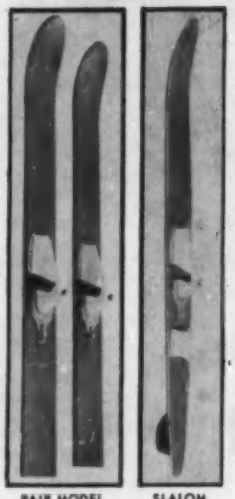

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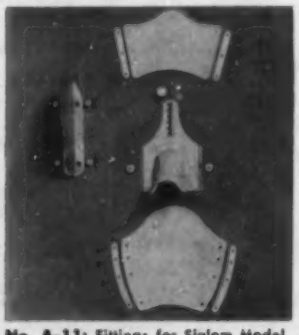

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Industrial Arts and Vocational Education
The Shop Teachers' Professional Magazine
JANUARY 1959

Our Automated Industrial Revolution—Part I

THOMAS A. HIPPAKA
Iowa State College
Ames, Iowa

Chronology

Throughout the ages, humanity has struggled to accelerate production of goods through better methods which have constantly involved improved hand tools, as well as machines. History clearly records man's striving for a better life, through his dogged pioneering and unceasing inventiveness.

Pioneering Man

Walt Whitman aptly glorified venturesome man and his daring spirit of incessant pioneering in these words:

> We detachments steady throwing
> Down the edges, through the passes, up the mountains steep,
> Conquering, holding, daring, venturing as we go the unknown ways.
> Pioneers, O pioneers!

There are those who believe that something happened to man a million years ago, which has since differentiated him from the animal kingdom. Such was the ultimate change in his pelvic bone that he could stand erect and walk, thereby freeing his hands, in order that he could use crude implements of his own discovery, or making. His first tools and weapons were composed of bone, stone, ivory, and wood. Gradually his cranial capacity increased, whereby he became more adept at modifying and using his primitive equipment.

Fifty Thousand Years Ago

Fifty thousand years ago man began to extend his arms by putting handles on his wedge-shaped axes and pick heads. This discovery gave him more power, as he wielded these essential tools, in order to eke out his primitive existence.

As a cave dweller, man lived primitively. Clothing was made from the hides of animals. The cave was the center of multiple family life. He utilized fire as best he could.

Primitive man realized that he needed cutting tools. as well as blunt-nosed ones. By sharpening edges on stone, ivory, or bone, he made himself a knife. A uniformly jagged edge on hard materials provided him with a saw.

From a forager, man developed into a real hunter. Six thousand years before Christ he was still pretty much of a forager. He next used a thrusting spear to kill men, as well as beasts. In due time he lengthened it into a throwing weapon. As time went on, he further extended his range of activity through a real invention, called a bow. The spring in the bent shaft made the arrow a deadly weapon of considerable force.

The family of the primitive man was a closely knit unit. The limited confines of a crudely dug cave naturally made it so. Any productive activity involved the entire family. Food, shelter, and clothing had to be wrested from nature. Tools and weapons were crude, and life had its hardships, peculiar to the times. Man's mode of living became easier as his working implements improved. Family needs were met through family efforts, closely tied together through common needs, interests, suffering, activities and pleasures, such as they were.

There were some evidences of community life, as early as forty-four hundred years before Christ. Mud-walled rectangular huts were to be found in small groups. It took almost a thousand years before stone was employed in the construction of dwellings.

The food production revolution followed shortly after man became a hunter. Man planted, cultivated, and harvested his own crops, while he continued to hunt for berries, nuts, and other eatables, provided by nature. Crude plows, sickles, and hoes were added to man's list of tools. When he domesticated his first animal, man took his initial step in storing meat on the hoof.

A very primitive form of capitalism existed as early as forty-four hundred years before Christ. Men built mud-block huts and banded together in villages. Old men and children shepherded the flocks and worked in the fields. There was ownership, freedom, and certain responsibilities in a still primitive, but more productive economy. The incentive to improve what one owned naturally resulted in greater production. Improved skills and tools brought added comforts and conveniences in the form of cooking utensils, pottery, woven cloth, and plaited mats. Bartering had

its beginnings in this era. The more primitive tools were improved, so as to create new implements, such as sickles, plows, hoes and looms. Ownership brought with it the so-called property rights of men, where justice was administered by the head man of the village.

Stone, Bronze, and Iron Ages

Thirty-five hundred years before Christ men were building stone dwellings. Full-time craftsmen were considered specialists by virtue of their skills in certain areas of work.

For almost a million years man eked out an existence with rather crude hand tools made of stone, bone, bronze, and iron. His crude equipment consisted of the mason's maul, ax, stone drill, as well as the tools for general purposes, consisting of the awl, knife, saw, hammer, adze, gouge, scraper, chisel, and hammer ax. Somehow, he began to understand the lever, screw, pulley, inclined plane, and the wheel and axle, as he used his hand-made implements.

About thirty-five hundred years before Christ, man invented the wheel. As a result of this invention, it was only natural for him to use animals as beasts of burden, and thereby ease his own work. For centuries, humanity has taken the wheel for granted, when in reality it actually revolutionized man's mode of travel, as well as the transportation of goods.

Three thousand years before Christ, man entered the bronze age. When he melted copper and strengthened it with tin and other metals to produce bronze, he reached a new landmark in his march of progress. For the first time in human history, he employed tools made of metal, which included the drill, crucible, knife, chisel, adze, mallet, tweezers, levels, and the saw. The bronze age brought sculpturing, mathematics, and surveying to the fore. It was a period of invention, which produced the keystone arch, the sailing vessel, glass bottles, the potter's wheel, regulated irrigation, and the balanced scale.

Fifteen hundred years before Christ, the bronze age gave way to the iron age, largely through the efforts of the Greeks and the Romans. It could very well be said that the foundations for western civilization were being conceived during this period of human history.

Iron was first utilized in making such tools as the plane, chisel, saw, compass, anvil, auger, shears, tongs, ax, and dividers. Each artisan was to have his own kit of tools. Iron ultimately played an important role in agriculture, building construction, navigation, war, and civic improvements.

The production of food, improvements in shelter, and the increased comforts of life, were greatly accelerated. Widespread hunger still prevailed among the masses, due to enormous population increases. Slavery, coupled with the slave driver's insistence to employ the muscle power of these people, caused untold human frustration. Although the Roman empire fell, and although her contributions remained dormant for centuries, they were to make a very positive impact upon world progress at a later date.

The bronze age was not without its difficulties. Naturally, there was a scarcity of metals. Food was available to metalworkers solely through nobles and kings, which finally led to the control of the masses by potentates.

Human beings had their first experience with the fallacy of state security when, as slaves, men were forced to glorify their masters in stone and masonry. Honest ambition was stifled; inventiveness was stymied; and the craftsman lost his independence. The torch of progress, which burned so brightly as the bronze age came into being, was not to be recovered until the Greeks and Romans came to the rescue six hundred years before Christ.

There eventually came a time in the civilization of man when the family group produced goods for outside consumption. Merchants supplied the raw materials and agreed to take and to pay for the finished product. The work was often done in the confines of the home. Thus the craftsman did not buy the materials from which the goods were made. Likewise, he did not always own the equipment with which he did his work. The worker did not determine the type, quality, or amount of goods purchased, as he had nothing to do with their sale. Thus the entrepreneur influenced extreme control over the worker.

The English feudal system of the eleventh century brought forth a far-reaching transformation. It did away with a self-sufficient agrarian economy, and brought with it a system of towns, which created more substantial markets for goods.

With this *industrial revolution* came the guild system. Guilds were made up of men who specialized in certain crafts, and who had exclusive rights to practice their trade in a local area; a right protected by public authority. Guilds functioned through internal regulation. They insisted upon controlling wages, quality of products, supply of raw materials, amounts and types of production, price, and even methods of distribution. In their eagerness to protect the worker, they were headed for a controlled economy. Apprentice, journeyman, and master's ratings were milestones in the career of a worker. The fundamental principle of the guild system was equality. Guilds attained considerable monopoly before they declined late in the thirteenth century.

Thus far, man's progress in the development of tools for purposes of production was anything but revolutionary, as we think of progress today. Relatively speaking, there had been accelerated progress at times, interrupted by social upheavals, slavery, pestilence, starvation, want and war.

As time marched on, change became paramount. Slavery was on the wane. More durable materials of manufacture resulted in better products. More equitable remuneration was forthcoming to those who were willing to expend greater effort in their work.

The Fall of Rome

In the face of hunger and want, man had continued to improve his tools. Although he progressed from iron to steel, as far as the materials for his tools were concerned, the full impact of this advancement was not felt until the eighteenth century.

In due time, came the fall of Rome, followed by her sorry decadence. Five centuries of chaos followed when man succeeded in surviving only through back-breaking toil, accompanied by force of arms. Men were so busy fighting each other that tools for domestic use became exceedingly scarce. It naturally followed, that craftsmanship techniques already developed, remained dormant. Men were forced to live in squalor as slaves of the lords.

The fifteenth-century Renaissance marked the beginning of an era of great achievement. For three centuries craftsmanship flourished, as did exploration, colonization, invention, production, and well-earned trade.

The times produced men like Da Vinci, Galileo, Copernicus, Dante, and Michelangelo.

The printing press had become a reality. Johann Gutenberg had invented movable type in the year 1450, making it possible to print books and periodicals quite readily for those times. The spreading of information became much more feasible, and men's minds could now be improved through the printed page, or the detailed plan. Apprenticeship was no longer the major approach to learning.

Man's materialistic future was acquiring new dimensions. Knowledge was becoming more accessible; man was gaining a somewhat greater degree of freedom; materials were becoming more functional; and the artisan's efforts were gaining greater recognition. Change became continuous, and to a certain degree, more accelerated.

A new milestone in human progress was reached when man substituted steam power for hand power and incorporated the principles of the lever, screw, pulley, and inclined plane into his power tool mechanisms.

The First Industrial Revolution

Then came the beginning of the first real industrial revolution. Machine tools, driven by mechanical power, characterized this era. For the first time tools were able to produce themselves through human ingenuity, all of which made mass production possible, and American technology became one of the wonders of the world.

Factory production, as we first knew it, had its beginnings during the latter part of the eighteenth century, especially in England. This type of manufacturing required fixed capital, free labor, and highly correlated production under a common roof. The shop replaced the craftsman as the productive unit in society. Better and better power driven machines were invented to meet the mass demand, long developed through trade and commerce, colonial expansion, as well as open markets in the New World. When England first went from hand production to machine production, the thirteen colonies in the Western Hemisphere were to remain merely buyers of English manufactured goods, without permission to develop a factory system of their own. This edict on the part of the British became one of the seldom mentioned causes of the Revolutionary War.

Factory production has brought negative, as well as positive effects. On the negative side we have produced industrial accidents of numerous kinds, various industrial diseases, slums, child labor, unemployment, strikes, transient workers, women workers who neglect their families, and ghost towns. On the positive side, we have accelerated production in order that more people can have the necessities and even the luxuries of this life.

Astounding developments have taken place in plant ownership. There was a time when the entrepreneur alone owned the industry. Later, families as such, were the sole owners of factories. Today, absentee ownership is characteristic of American industry. Stockholders have a right to demand reasonable returns on money invested in an industry, plus the privilege to share in the control of the enterprise. Leading shareholders in many businesses are banks, insurance companies, brokers, and investment trusts.

Competition is characteristic of our capitalistic system in America. The emphasis in our economic system has been on individual opportunity and free, competitive enterprise. Decades ago, Lenin tried to tell the world that Capitalism and Communism could not exist side by side; one or the other would have to go. In the year 1957, Nikita Sergeyevich Khrushchev warned us that our grandchildren would be living in a socialistic state.

We must continue to do everything in our power to preserve our democratic processes. By so doing, there will be respect for human personality; real, individual effort will always be rewarded; initiative will be engendered; discipline will come from within each citizen, and not from a dictator; freedom will accompany responsibility; men will do what they ought voluntarily; while the spirit of competition which made America great, will be preserved for future generations. The Constitution of the United States does not guarantee happiness; it guarantees equal opportunity for all in the pursuit of happiness.

There have been far-reaching changes in industrial administration. In the modern scheme of things, the entrepreneur has all but vanished. He has been eclipsed by professional management. Highly skilled men who have developed industrial management into a profession, manage much of American industry. Employed administrators working under boards of directors, who in turn are elected by the investors, typifies the American industrial system.

Policy making, too, has passed through some interesting and consequential transformations. Policies are no longer determined totally by boards of directors. Labor has made great inroads into this area. Too often, the consumer suffers unduly, while labor, management, the government, the board of directors, and stockholders fight for the lion's share of power to control the policies of the industry.

Technocracy

As early as the year 1914, efficiency in industrial production had reached noteworthy proportions. Needless to say, productive efficiency in those early days was a far cry from what it became in a matter of a decade or two. The tempo of the times was ironically expressed by an unknown author in these words:

> Efficiency, efficiency,
> I'm just a wee bit tired of thee,
> Despite thy glowing brilliancy.

As the so-called "efficiency craze" reached its height, a new, short-lived term came into being. "Technocracy" was the caption applied to the then evolving industrial economy. The enthusiasts in this "movement," known as the "technocrats," were to remake our industrial system in some mysterious way, where the method, as well as the amount of production, bordered upon the mystical.

Physicist John H. Troll summed up man's endeavors in the area of machine and tool development for all times in these words:

> Machines and tools have always been created in the image of man. The hammer grew from the balled fist, the rake from the hand with fingers outstretched for scratching, the shovel from the hand hollowed to scoop. As machines became more than simple tools, outstripping their creators in performance, demanding and obtaining increasing amounts of power, and acquiring superhuman speeds and accuracies, their outward resemblance to the natural model disappeared; only the names of the machine's parts show vestiges of their human origin. The highly complex machinery of the modern industrial age has arms that swing, fingers that fold, legs that support, teeth that grind and male and female parts that mate. Machines feed on material, run when things go well, and spit and cough where they don't.

Some Key Inventions

Throughout the years of our industrial progress we have taken too many machine developments for granted. We need not go too far back into history to see where man first controlled fire. He made pottery cooking utensils for preparing his food. Later he developed the wheel, and he wondered how he had existed without it. Then came such inventions and developments as gunpowder, steam, electricity, gas, the combustion engine, the automobile, the production line, the airplane, our fantastic communications system, electronics, automation, and nuclear energy.

We have accepted evolution and even revolution in the development of automatic equipment with a goodly degree of casualness, although its refinement ultimately led to the almost unbelievable process now known as *automation*. We forget that the development of many of our modern machines came gradually through the untiring efforts and personal sacrifices of inventive pioneers.

To review some of the key inventions in our industrial development during the past two centuries is to indulge in a very fascinating activity. The inquisitive spirit of these pioneers was not to be denied.

It could very well be that the Reverend Walton Cole had these pioneers in mind when he related the following story entitled "What Man Knows Man's Limitations":

> "The millennium is at hand. Man has invented everything that can be invented. He has done all he can do."
>
> These words were spoken by a bishop at a church gathering in 1870. They were challenged by the presiding officer, who suggested that a great invention would be made within the next fifty years.
>
> The bishop asked him to name such an invention.
>
> The reply: "I think man will learn to fly."
>
> The bishop replied that this was blasphemy. "Don't you know that flight is reserved for angels?"
>
> The bishop was Milton Wright, father of Orville and Wilbur.

The November, 1955, issue of the *Think Magazine* carried these words by C. C. Furnas:

In 1769, James Watt of England received his first patent on an improved steam engine. Subsequently, steam power was adapted to manufacturing processes, and the Industrial Revolution was well under way. Although the Industrial Revolution is usually considered something which was completed in Western Europe in a generation or two, it is my contention that it is just now getting started. We see the evidence of that in the rise recently of a new term — "automation." Automation is merely a new word which is used as a label for the industrial processes wherein machines are used to operate or even build the machines which produce consumer's goods and services.

In 1775, John Wilkinson invented the boring mill with which to manufacture accurate steam engine cylinders for James Watt.

An automatic grain mill was already in operation in Philadelphia as early as the year 1784.

The year 1785 witnessed the appearance of Cartwright's power loom.

Whitney produced his amazing cotton gin in 1791.

Food manufacture was the first industry to make extensive use of automatic equipment. In 1794 Oliver Evans contrived a continuous flour mill where the grain fed into it was never touched by human hand throughout the grinding and bagging processes.

The plow, the steam locomotive, Fulton's steamboat, and McCormick's reaper were added to the long list of inventions about the year 1800.

After many years of hard work Maudslay succeeded in making a satisfactory lead screw which made the first screw-cutting lathe possible in 1797.

The evolution of the engine lathe constitutes a story in itself: In the year 1800, and shortly thereafter many further improvements were made on the lathe, which was first built by Maudslay in 1797. Henry Maudslav and Joseph Bramah made decided modifications in the former's original efforts.

As early as 1798, Eli Whitney produced component parts of a rifle accurately enough to make interchangeable assembly a possibility. His successful demonstration of such interchangeability before a group of more or less skeptical governmental officials made mass production a reality, with greater possibilities for increased production.

In the vear 1801 Jacquard produced a loom that wove a desired pattern automatically, according to the cards fed into it.

The copying lathe was invented by Thomas Blanchard in 1818. Its defects were overcome by Keller in the copying lathe, which he constructed many years later.

The first machine lathe had to be set up for each succeeding operation, which necessitated the unclamping and resetting of each piece for every operation. To overcome the problem of machine setting, the required number of lathes were next installed, one for each operation, where the pieces were moved from one machine to the next. Then came the turret lathe, with its various cutting tools capable of performing several operations at the same time, on the same piece, set only once in the lathe. Finally, we had the ultimate in lathes, where the tools stay in place, and the piece to be machined is presented to each tool according to plan.

In order to produce interchangeable musket parts, Eli Whitney invented the first milling machine in 1818.

Biscuit making was mechanized for the Royal Navy in 1833.

In 1840, James Nasmyth invented the first drill press with an automatic power feed.

The continuous monorail for the packing of pork became a reality in Chicago during the year 1869. This single rail arrangement, with its necessary appendages, was a forerunner to Ford's assembly line.

Although the first band saw to be used in sawing wood was originally patented by Newberry in 1808. and band ends were successfully joined by M. Perin in 1846, it was not until 1888 that the first practical band saw appeared on the market.

The Bessemer process, the cylinder press, Howe's sewing machine, and the Diesel engine constitute relatively modern inventions in the area of industrial development.

Early in the twentieth century automatic controls made their first appearance. The thermostat is taken for granted, largely because of its universal use. We know that it first measures the inside temperature of the house, and when this drops below the temperature for which the thermostat is set, the furnace is automatically turned on, until the desired temperature in the house has been secured. The thermostat constitutes a good example of a closed system of control. It also demonstrates time lag, in that after the thermostat has increased the fuel supply to the boiler, it takes some time for the house to get warm.

Late in the nineteenth century Joseph Bramah invented the hydraulic press and lock, the water closet, and the hydraulic valve.

In the year 1915 the Ford Motor Company awarded the A. O. Smith Company of Milwaukee an order for 10,000 automobile frames. Within six years, at a cost of eight million dollars, America had the first automatic assembly plant.

As early as the year 1930, Milwaukee had its first automatic production line, which made 10,000 chassis for automobiles. Nine separate units linked by automatic handling devices inspected incoming strips of steel, rejected the unsatisfactory materials, cleaned, bent, and drilled the satisfactory pieces, assembled and riveted the pieces, after which they were washed, painted, and sent to storage rooms.

Morris Motors, Ltd., produced the first automatic group machines known as transfer machines in the year 1923. This expedited the manufacture of cylinder blocks far beyond all expectations.

In the year 1924, James Archdale produced the first machine with automatic transfer and clamping.

The Automatic Factory

When Sargrove first manufactured radio sets with printed circuits in 1947, he established the first *automatic factory*. About the year 1950, a record was established when radios were assembled at the rate of 1200 per hour or 10,000,000 per year.

Of more recent date is the *ribbon machine* which produces the glass envelopes for electric light bulbs and electronic tubes, where human hands never touch the raw materials, or even the finished products, which is automatically packed in cartons and loaded into railway cars.

Leibniz was the first to propound the idea that the concept of feedback afforded a unifying basis for work in many areas of science. No doubt, he observed self-regulatory mechanisms in the human body, as well as those in nature, and the animal world.

Andre Ampere became the author of the term *cybernetique* with which he denoted the effect of feedback on science. He adapted it from the Greek word for *helmsman*, from which developed the term *governor* which is still in common use today.

Norbert Wiener popularized Ampere's effort with the word cybernetics.

Continuous Material Inspection

Continuous inspection while materials are being processed has been practiced for a very considerable period of time. The thickness of steel strip, as it is rolled at a speed of 1000 feet per minute can readily be measured. The thickness of translucent materials can be gauged continuously by placing a light underneath, and a photoelectric cell above it, thereby measuring the amount of light piercing the materials. Steel strip can be measured in a similar manner by using a source of radiation, and a radiation counter. The thickness of the layer of tin, when tin plating is done, can be calculated by finding the amount of radiation reflected from the surface of the iron beneath. Equipment has been

perfected with which it is possible to measure such properties as acidity and density. The proportion of carbon dioxide in a gas stream can also be measured by inserting a hot rod into the stream, and ascertaining the rate at which it loses heat. The grade of gasoline made in a refinery can be continuously determined when the molecular weight of the product is known. Continuous analytical equipment is indispensable in modern industry; without it, the process known as *automation* cannot exist.

Mankind employed fire in warfare very shortly after its use in peaceful pursuits. Many thousands of years ago, primitive people used fire arrows when in combat with their enemies.

The Chinese stumbled onto the secret of gunpowder by playing around with such materials as sulphur and saltpeter. They added gunpowder to their fire arrows, so the rocket principle was first employed 1200 years before Christ.

As is so often the case in the development of new devices, the rocket principle was used and lost a number of times between 1200 B.C. and A.D. 1400. However, by the early part of the eighteenth century. all of the leading world powers had organized rocket corps with rocket batteries.

Rockets are not new in this hideous business of war. Copenhagen was destroyed by the English with naval rockets during the Napoleonic Wars. Rockets were employed at the siege of Fort McHenry. In the War of 1812, Andrew Jackson fought rocket brigades at New Orleans.

Rocketry Not a New Science

The development of propulsion power for rockets presents a fascinating picture. The most primitive form of a rocket consisted of a cylindrical container filled with gunpowder, and open at one end. The serious difficulty with this form of fuel was that the gunpowder detonated almost instantly.

A slower burning fuel became an imperative, if rockets were to be of any consequence. As early as 1903, the Russians were very active in this field. However, it took a Peruvian engineer to develop the first liquid fuel that worked in a rocket, as we know it today. Early in the year 1958, the Navy's Vanguard rocket delivered a thrust of 27,000 pounds in its first stage in order to place a three and one-fourth pound, six and four-tenths inch sphere in orbit.

Industrial progress in the United States since the year 1950, has been miraculous indeed. Looking at America in that year of our history, twenty-three million people produced ten billion horsepower hours of energy, making a total of four hundred and forty horsepower hours available to each person. In the year 1956, a nation of one hundred and sixty-eight million people produced a total of seven hundred billion horsepower hours, or four thousand five hundred horsepower hours per person. In the year 1957, we produced twice as many goods and services as we did in the year 1900.

It is predicted that in the year 1980, there will be no need for electric meters, because energy will be as free as the air we breathe. In the year 1850, man worked seventy hours a week; in the year 1958, forty hours or less. The forecast is made that in the year 2000, man will be working only twenty hours a week, due to the miraculous labor saving machinery at his command.

It is no wonder that the *Life Magazine* was prompted to carry the following statements on October 7, 1957:

> The present lives and future fortunes of every American man, woman, and child are directly and immediately affected by the gigantic technical strides of the past few years. Whether we know it or not, whether we like it or not, the daily life of each of us is being changed — and is destined to be changed far more — by events taking place in laboratories and factories across the land.
>
> Any important scientific or engineering advance always sets off a chain reaction. It creates comforts and hazards. It organizes the economy and disorganizes it. It provides social benefits and poses moral problems. This has been true since history began. But such advances used to be few and far between. Their impact came so slowly that a man was hardly aware of any major change in his own lifetime.
>
> The pace of change was stepped up with the Industrial Revolution. And in the years since World War II the advances have come with an overwhelming rush. Today the progress of 100,000 Stone Age years is surpassed in a single year and the great accomplishments of the last century are eclipsed by those of the last decade. "In one generation," J. Robert Oppenheimer observes, "our knowledge of the world engulfs, upsets and complements all knowledge of the natural world before. . . . The world alters as we walk in it." Technology is no longer the exclusive province of engineer and industrialist. Its creations are part of every man's everyday landscape — as abstruse molecular formulas produce new fabrics that make laundering easier, as the work of cyclotrons is translated into better ways of preserving foods.

(To be continued)

Job Planning in Industrial Arts

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Each year the opening days of school find thousands of boys and girls pouring into industrial-arts shops in schools all over the United States. Many of these young people are about to receive their first formal experiences in shopwork. Anticipation is great. Working in a shop and using tools are brand new experiences for most of these pupils. Very few have had an opportunity to use tools, either correctly or incorrectly. The shop teacher, having a broader concept of what the shop represents, realizes that it entails more than simply making things. He realizes he has the responsibility for presenting a sound, well-rounded program using the best methods and procedures known.

Shop teachers are thus committed to teach amid this sea of inexperience and eagerness. As school doors open, the shop teachers are immediately faced with a host of problems. What is the best way to proceed in getting classes under way? What methods produce the best learning outcomes? What approach should be used to teach skills, related information, and planning?

Many shop teachers start their beginning classes to work using required core projects. These core projects are used to teach certain basic skills and

information. After completing the required core projects limited elective projects are made available. After the most important skills and processes have been mastered some shop teachers then use free electives. A core project is one, selected by the teacher, that all pupils are required to make. A limited elective is a project selected by the pupil from a group of similar projects selected by the teacher. Limited elective projects, while they are different objects, contain approximately the same operations and provide an opportunity to teach similar informational content. A free elective is a project chosen by the pupil subject only to the teacher's approval.

Getting the Class to Work

The problem of actually getting beginning shop classes to work is, in the main, approached from two directions by shop teachers. One approach is to completely plan all the details for making the beginning core projects. This includes the working drawing, bill of material, and the steps of procedure to make the project. This information they duplicate and give to the pupils who construct the project following the plan laid out by the teacher. It can be seen that pupils taught following this procedure begin their shop experiences with little or no opportunity to participate in the actual planning of the beginning projects they are to construct. However, they do have the advantage of following a well-made teacher plan. Perhaps advantages accrue from following such a plan. Certainly classes taught using this approach are able to get started to work rapidly and, therefore, take advantage of the natural interest and the desire to make things with which these beginning pupils are so heavily endowed.

After these pupils master the fundamental tool processes taught during the period of time in which they were following the teacher-made plans, they then move into making projects that are classified as limited electives. At this time the pupil is required to complete his own material bills and plan his own steps of procedure. It is here that he has his first formal, guided planning experiences.

A second approach used by other shop teachers is to have their pupils participate in project planning from the very first day of class. These teachers prepare working drawings for the core projects but do not give the pupils the completed material bills or steps of procedure. The class as a group, under the direction of the teacher, studies the working drawings and plans the materials that are needed and the steps of procedure necessary to make the core projects. All pupils are encouraged to participate in the planning sessions. The pupils are guided to see what should be done and why things are done in the order they are listed. The pupils also participate in the planning of all limited elective and free elective jobs, eventually planning as individuals with the teacher approving the plan. This approach consumes considerable time, especially at the beginning of school when the pupils are clamoring to "make something." It occasionally becomes a problem to hold the pupils' attention long enough to do a thorough job of planning. This may be due to natural restlessness or a lack of the background on the part of the pupil necessary to give meaning to the planning. The question remains as to which approach is most effective.

The Teacher Planned and the Student Planned

In a recent study[1] an attempt was made to ascertain the relative effectiveness or superiority of these two approaches to teaching beginning shop classes. The approach using initial instructional materials planned completely by the teacher was called teacher-planned and the approach involving pupil participation in planning initial instructional materials was called pupil-planned.

These two approaches the teacher-planned and the pupil-planned, to starting beginning shop classes were compared on ten outcomes. These were:

1. Informational achievement
2. Quality of work performed
3. Quantity of work performed
4. Skill achievement
5. Ability to read working drawings
6. Ability to analyze and plan procedure
7. Economy in use of materials
8. Errors made in project construction
9. Ease of teaching
10. Attitude toward shop class

An examination of the outcomes of the previously mentioned study made it possible to draw the following conclusions:

1. The pupil-planned and the teacher-planned approaches to teaching beginning shop classes are equally successful in teaching informational content.

2. Both approaches, the pupil-planned and the teacher-planned, produce completed work of equal quality.

3. The teacher-planned approach is *significantly superior* to the pupil-planned approach when quantity of work performed is considered.

4. In so far as the factor of skill achievement was concerned, the pupil-planned and teacher-planned approaches are about equally effective.

5. The pupil-planned approach is *superior* to the teacher-planned approach for developing the ability to read working drawings.

6. From the standpoint of developing *ability to analyze and plan* procedures, the pupil-planned approach and the teacher-planned approach are about *equally effective.*

7. The pupil-planned approach and the teacher-planned approach differ very little in the effect they have upon economy in the use of materials.

8. The number of errors in project construction is influenced about the same by the pupil-planned approach and the teacher-planned approach.

9. While the data concerning the ease of teaching was inconclusive, it is the opinion of those involved in the study that the pupil-planned approach, in the long run, requires *less teacher effort* be expended than does the teacher-planned approach.

10. The pupil-planned approach develops a *significantly* more favorable attitude toward shopwork than the teacher-planned approach.

These conclusions indicate that neither approach is consistently superior to the other. Both approaches to teaching beginning shop classes have merit and the solution is not a matter of scrapping or discrediting one.

Teacher Planned Approach Seems Best

The results of the study indicate that the teacher-planned approach gets classes off the chairs and to work rapidly. It also enables the pupils to complete a significantly greater amount of work. The delaying of the pupil participation in planning does not hinder the pupil's ability to plan. This implies that it is perhaps best to start beginning shop classes using teacher-planned materials. The use of these materials is also a practical necessity because of the large classes and heavy teaching schedules of today's shop teachers. Individual planning by the pupils in beginning shop classes would be a most difficult assignment under these conditions. The pupils, being inexperienced in shopwork, do not know what to expect or how to plan. Much time is wasted as a result. In order to get large classes started efficiently and with a minimum of confusion, the teacher, of necessity, must do the initial planning.

Since no significant difference existed between the teacher-planned and pupil-planned groups on ability to plan at the conclusion of the experiment, the delaying of pupil participation in planning until a time more suitable in the course did not adversely affect the pupils. Starting the classes with teacher-made

[1]Spence, William P., "Job Planning in Shop Teaching: An Experimental Comparison of Two Approaches." Unpublished Doctor's dissertation, University of Missouri, Columbia, 1957.

plans greatly facilitated getting the classes off to a rapid and organized start and permitted the teacher to take full advantage of the natural interest and energy of the pupils, thus aiding the purposing activity. The pupil-planning activity probably would have been more beneficial had it been undertaken after the pupils developed a background in shopwork. This would perhaps make the planning experiences meaningful and more beneficial.

A summary of the findings of the study implied that since neither approach to teaching beginning shop classes was found to be statistically superior, perhaps a combination of the two approaches would enable a teacher to utilize the benefits derived from both. Practically speaking, it is probably best to start beginning shop classes using teacher prepared materials in order to facilitate the job of teaching and to obtain the advantages of a rapid start. To derive the maximum benefits from pupil participation in purposing and planning, it is believed best to delay it until the pupils build up a background in shopwork. Then the experience of pupil planning can be injected into the class situation and its benefits realized.

Industrial Arts in Burma

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Halfway round the world, in central Burma, a vigorous and well-intentioned industrial education program is under way. An extensive reshaping of educational practice was initiated shortly after independence was declared but the industrial arts program is only in its third or fourth year of application. It falls a little short of the mark established earlier but is definitely on the right road to training Burma's awakening youth for the staggering industrialization that lies immediately ahead of them. The problems that are to be encountered in this typical technologically underdeveloped country are similar in magnitude and general character to those found throughout the world. Attention to the needs of the people and the tedious structuring of the developing program become an exciting kind of real life chess game for the western *expert* once some initial frustration is experienced and understood. What the government has accomplished and intends, and what the individual western adviser can offer require a careful examination. Only a general outline can be sketched here but it will illuminate some of the kinds of problems encountered in one location and their solutions.

Industrial Teacher Training Started in 1952

The industrial-arts teacher training program started in 1952 with 25 men. It was only in 1955 that the New Educational Plan in Burma included provision in the school curriculum for vocational subjects such as industrial-art and practical agriculture. A State Scholar program was established to allow selected teachers and graduates to take advantage of overseas study opportunities and this seems to have worked out very well. The range of manual-arts experiences in the curriculum now established currently resemble those of the U. S. marginal areas during the 1930's. The generous insertion of basket making, card weaving, clay modeling, wood carving, book binding, lacquerware work

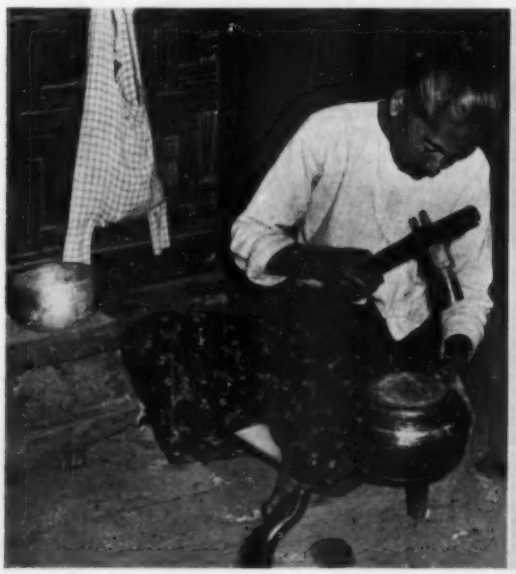

Fig. 1. Burmese brassworker making a bowl out of flat ¼-in. stock. Fig. 2 at right — Karen (manpower) table saw, from the Kayah State in east central Burma

and several other handcrafts into the curriculum is said to serve as a transitional element in approaching machine work. Actually the crafts represented could in some cases be claimed to be industries in Burma by virtue of their production line methods, job specialization, and use of relatively complex equipment and processes. They lack only electric motive power. The bookbinding in Burma is done commercially with essentially the same equipment as was used during the Middle Ages in Europe. The mass production method in sheet-metal work is a well-established process, and a man may become isolated in some highly specialized phase of metal shaping or finishing even though all his tools are hand operated. The government handcraft school includes tin smithing within its curriculum. However, in some vocations such as carpentry and cabinetry, it has become habitual to make things only to order. When applied to loom building in Burma as an example, an inflexible system of production only up to the level of the outstanding orders has developed even though it is well known that hundreds of looms are sold by each village

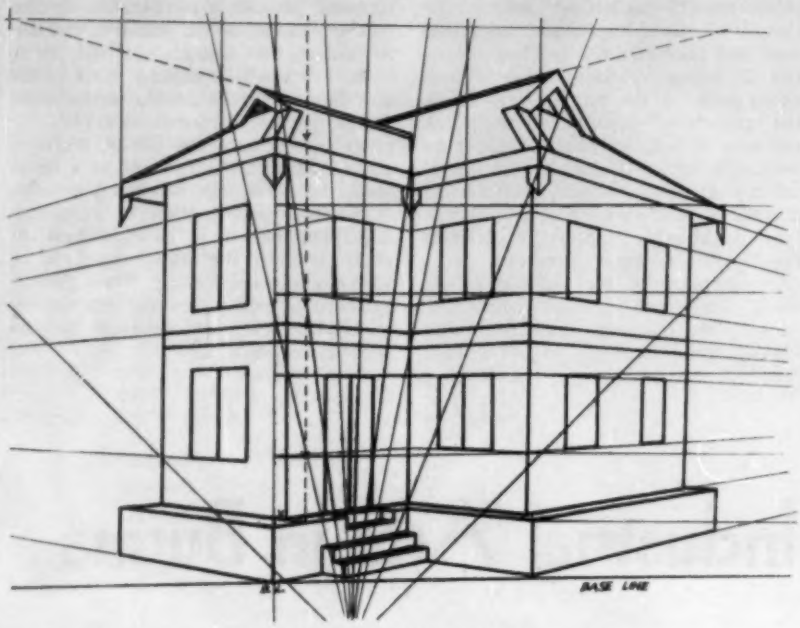

Fig. 3. Perspective drawing taught in the industrial-arts course

Fig. 4. Inlaying a fine silver wire in iron

woodworker every year and in spite of the possession of elaborate templates, jigs, etc. Actually there are some of these old established trades in which a complete revision of technique seems necessary. The apprentice system in some trades yields only old-fashioned craftsmen without an eye to ways of expanding, increasing production, simplifying operations and in general modernizing. There are also unfortunate financial blocks currently to expansion as we know it. Part of the training school's program where I taught then is to tap the potential artisans within the regular school apparatus, but more importantly (since there is an independent government program for machine trades teaching) it is expected that the carefully innoculated new teachers will proselytize for industrial training among the tribal hill peoples in their native locale. It is hoped in addition that the teachers will recognize talent and counsel the students to enter professional technical training programs or the government artisan training centers. The western notions of educating a student to be aware of his highly articulated industrial environment, to care for common domestic utilitarian machine devices, etc., though pedagogically sound, currently serve little purpose in Burma. Real harm is done by misplacing the emphasis in incipient industrial programs. The needs will change certainly but the largest single requisite in Burma's program currently is to stimulate a genuine interest in practical studies. The Burmese have for generations idealized theoretical studies if they were interested in schooling of any kind other than for the priesthood. Manual arts activities are still regarded as vastly inferior pursuits for a person of any individual worth. The new program seeks to reform the old educational process by introducing more practical methods and initiating vocational education as early as primary school.

Hand Tools and Machine Tools

At a time when many of our educational institutions have split apart or are trying to separate handcrafts from machine operations and disentangle their programs, Burma is actively incorporating handwork with its most advanced power equipment. This is done in accordance with the principle that they should be able to see what the far end of the industrial circumstance can be as well as find some place where they can currently apply themselves. A typical example is the handweaving of baskets which are impregnated with sawdust and lacquer and then surfaced

with sandpaper before the lustrous final lacquer finish is applied. The baskets are made on a form, trued and filled with the viscous lacquer dough and chucked for trimming and surfacing on a lathe. Presumably a time-honored traditional ability is captalized on to illustrate the faster, more accurate, labor saving devices available as well as to provide training a student in the simple operation of and appreciation for a machine. In the newest artisan training school in the country, where diesel engine and pump operation, blacksmithing and heavy industrial machine lathe operation are part of the curricula, a government publication officially advises the inclusion of toy modeling, cane work, leather work and other hand methodology.*

Voltage Varies

Another problem exists in that excepting only the central lowland cosmopolitan centers and isolated highland areas, Burma is virtually without electrification as we think of it and where there is power it is variable and irregular still. (For over 1 h.p. motors there is, in central Burma's larger cities, 3 phase 400 v. 50 cycle power. It's declared voltage is + or — 5 per cent. The singie phase 220 v. is sometimes 200 v. especially around 6 p.m. when there is apparently heavy loading. It even varies from 150–160 in many residential areas so that some people have put transformers in the line themselves to utilize 110 v. current.) The current inadequacy of rural electrification means that even if sufficiently trained in the use of jointers, hand saws, table saws, planers, machine lathes, kilns, etc., the teacher or artisan that establishes himself in the hills will have skills without a means of application. Hence the training institutions have to serve the few urban centers in one way and also meet the needs for hand tool abilities to serve those established in rural areas. Fortunately, with Burma's great reliance on the west for the establishment of the training programs and the setting up of goals, a remarkably careful investigation was made so that the plans in effect are especially fitted to Burma's unique needs.

The trades abilities already extant are not to be discounted. In an underdeveloped country like Burma there is to be found a broad and profound base of practical arts so that training programs do not necessarily start from scratch: the carpenters' tradition is rich with talent as pertains to the kind and quality of individual products as is that of the metalsmiths. What the current program aims for is attracting students to the various manual pursuits and simultaneously endowing them with the talent to handle the old jobs with the responsible craftsmanship of a new era. Burma's indigenous manufacturing industries are limited. They include aluminumware making, bamboo ware, blacksmithing, leatherworking, cabinetwork, brass and bronze casting, metal spinning and forging, galvanized sheet iron working, ivory, stone and wood carving, crucible brick and tile making (a relatively new industry), cotton ginning, gold and silver working, lacquerware manufacture, lapidary work, earthenware pottery — glazed and unglazed, and weaving of cotton and silk.

The specifics of industrial-arts training as it functions presently, aside from the special artisan schools and technical institutes, illustrate a purposely limited program: they do not learn to make their own tools as a regular part of their training; they do little designing of their own products, either in terms of their appearance or in respect to their intended utility; they observe things like machine lathe operation and have typical woodshop power equipment demonstrated but do not as a rule use the equipment except as special students with a teacher closely supervising. These kinds of limitations, viewed from the ramparts of our own system, appear critical to the development of an industrially sensitized individual. But, with the current stigma that attaches to manual training of any kind, this approach seems to be the least offensive and the most consistent with Burma's markedly limited facilities. Essentially the program aims to prepare teachers toward an enlargement of the number of secondary schools offering shop courses. The central purpose is not vocational on the lower levels but to locate students with natural manual inclina-

*Report of Technical, Agricultural, and Vocational Education Committee, Government Printing Office, Rangoon, 1955.

Fig. 5. Coin silver bowl ornamented in the traditional Burmese repousé technique. Fig. 6 at right — Highland weaver using the traditional back strap loom

Fig. 7. Adze in use in the highlands. It is used for finishing because of the absence of electric power. Fig. 8 at right — Highland swordsmith caning the handle

tions. The capitol of the Kachin State in north Burma is better off than most cities since it is easily accessible, has been relatively free of the effects of the insurrection since 1949, has benefited from U. S. war surplus materials and tools and has a wide range of public and private educational institutions. The most fully equipped industrial arts shop in the state was in an unwalled shed with plaited bamboo roof and dirt floor in 1956. There were war surplus Desmond-Stevens woodworkers vises, mounted one to a side, on 9 heavy Engyn (Pentacme Suavis) wood benches. Most of the hand tools were British, but poverty restrained them from metal planes and like products of Western industry. The only power equipment consisted of a gas engine powered heavy duty table saw. Carpentry and cabinetmaking were their main concern, but conventional hand saws numbered less than a half dozen and the teeth were set with a hammer and nail. The cost of their own indigenous teak is 5 times that of Sagawa (champak) so they make cabinets of the latter which is given a zero rating for retention of shape according to a government publication.

Lacks in the Industrial-Arts Program

I felt certain lacks in the program as it was actually functioning and made a gesture at least in what seemed to be the right direction. The turning or tension saw in use is equipped with a wooden compression bar or stretcher that rides free, held only by the friction of the vertical end posts or handles. I made a model with the bar inset in the end posts to illustrate in class. The former type allows the compression rod to slip out and then the blade is easily broken. I made chisel handles utilizing a heavy conical ferrule since none of the chisels are socketed in Burma unless imported. I turned mallets so the chisel handles wouldn't be smashed by the hammers that are instinctively used. They have indigenous handmade wooden smoothing and block planes like the widely used European models. Their forged blades don't keep an edge for long but they are less brittle and easily made. I made a miter box, since we had none, which proved quite useful for lap joints since we had only one or two try squares. I made a stitching frame for high speed book sewing to replace the slow and clumsy method in use, but it did not catch on. I made a book vise for planing, for sawing book backs as a high speed hole making device and for single sheet binding with cords. A book plow built onto a table by a Burmese teacher who had received training in the States was in use in addition. The electrically operated circular saw blade had been ruined by filing and setting without a guide on the principle that anything jagged must cut. We had to machine it on a lathe to put it to use. A new one was obtained but the center hole was too large so we cut a stepped recess on the shaft and with washers the same shaft took 5/8 and 1/2 in. diameter blades. We had almost no audio visual aids. I provided some in the form of models of the common hand and machine woodworking joints which I mounted with their orthographic and isometric plans for wall displays. I contributed a number of house plans: floor plans, elevations, three part perspectives and made special sectional models to illustrate how the plan indicated the reality. I made job sheets for about twenty principal woodworking projects and made photographic montages illustrating essential shop experiences within the realm of industrial arts. These latter were designed to reveal the purposes of manual education in its broadest sense and underlined in particular our western notion of fostering a behavioral change presupposed by the commonly enunciated objectives of our texts: No change, no gain. It was a start anticipated by the local administration and plans for bulletin boards were already on file. In addition movies were more and more being sought from U.S.I.S. libraries. I tried to help this along by drawing on those resources weekly myself.

Teaching Through an Interpreter

Since through an interpreter I could explain only the little essential information about safety or the most fundamental methodology that is easily translated, I tried mainly to set examples. I tried to stop the students from sharpening the screw driver to a point "so it would fit all sizes" and from using hammers to drive (unsocketed) chisels. I changed some tool design, showed them that washers prevented nuts from tearing into the wood on their bolted wooden tools (but washers were not currently available anyway). I illustrated with the lathe that it was faster to turn many wooden parts than sawing or chiseling them, that a drilled hole and turned dowel are faster to make than a rectangular hand cut mortise and tenon for a number of small scale jobs they had. I made cotter pins of annealed iron to get away from nail and bamboo splinter pins which were hazardous and either too tough or too weak for convenience. I threw numberless pots on a kick wheel

to illustrate that not only was electric power not vital but that mass production was meaningful by this method and that the laborious Burmese method of half throwing, half paddling, is clearly unnecessary. Mostly the students just watched, however, and I convinced myself better than anyone else. I would change the program with its current heavy emphasis on drafting houses and other essentially meaningless objects (for them) to one concentrated on reproduction of the most critically lacking equipment for the typical rural areas where the students will return. I would, in addition, lessen the heavy drawing emphasis so that more practical work could be done even if that were on a very small scale such as in the building of models. Some toy making and visual demonstration material for other classes is currently included in the instruction. This could be broadened to include constructing specimens of equipment, furniture, classroom layout etc., which is likely to be meaningful in the materially limited rural environments. This kind of thinking already is in effect as far as utilization of native materials is concerned: use of rice flour as glue, spirit thinned lacquer as polish, galena glazes for earthenware pottery, treadle operated jig saws, foot powered kick wheels, hand cranked fly wheel table saws, and the like. Some very common items in the States are rare and expensive luxuries in Burma. Plaster of Paris costs a small fortune. Some standard materials fail to serve in the tropical humidity like the book binder's glue and hide wood glue I brought along on trial. These kinds of examples imply that Burma's program is essentially sound as it tries to curb dependence on some Western teaching methods even if it still relies on basic Western machine techniques. But the price of independence in the modern world, as a government publication suggested, is at least a degree of technical autonomy.

The old gentleman with whom I taught during the first half of my year in Burma expressed his dismay repeatedly over the kind of foundation he could expect his students to have. They were detached from their regular studies by war, the insurrection, without experience and seemed hopelessly ignorant about industrial arts at first. He watched one student smash a piece of delicate U. S. aid machine equipment he had detailed him to repair with careful instructions. He leaned back sadly, closed his eyes and said "Made in America, ruined in Burma."

I left some things with the school at the end of the year — my drafting set, ink, ruling pen, set of lathe bits, several triangles, 10th and 16th scales, a pottery text, crank grinder, a dozen jack planes, and a woodworking text. Whenever new books and useful tools are left under the Fulbright program, the cost is met by the U. S. Government up to a stated maximum. The U.S.I.S. library had sent, I noted, a number of gratuitous copies of good books covering a very wide range of hand craft and industrial arts practices. I am afraid the effect of these will be steadily diminished as Burma's literacy in English continues to decline. Only a few of the instructors and one or two of my hundreds of students could read the books we had.

How Burma's Industrial Arts Needs Are Met

Burma's industrial arts needs are being met differentially. Traditional manual education in post-colonial oriental Asia is not going to bring the quickest results. Some villages have outstanding lacks and want assistance in developing a particular small industry and they cannot afford foreign experts so that they are dependent on the products of various Burmese schools. The larger government high schools have some industrial-arts instruction now even though the tools are limited. In one school I found the reverse: 4 cases full of excellent English hand tools but they had not yet found a trained teacher who knew how to use them. Special schools, some government supported, some private, have been established to meet Burma's emergent industrial needs as well as to sustain traditional talents. There are schools for example which specialize in textile mill operation. In Mandalay the weaving institute offers also handweaving, dyeing, and textile serigraphy as well. There are now between 20 and 30 weaving schools established in Burma for the teaching of spinning, dyeing, and weaving. Two of these schools teach textile printing in addition. As with schools of vocational education in the United States, only those subjects in which there is public interest and the likelihood of employment are offered. In Moulmein there is a pilot plant which is a ceramic school, research center, and factory in one unit, in support of one of Burma's indigenous industries as well as to meet her new needs for refractories and insulators. There is a school of lacquerware manufacture in Pagan, and there are even specialized schools teaching tailoring and shoe repairing as principal units. There are now two government technical institutes for engineers which include a variety of shop experiences in their curriculum. The students in these institutions have to learn the principal hand skills such as sheet-metal working, carpentry, etc., as well as machine lathe operation, typical power operated wood and metal shop equipment, electrical circuit installation, plumbing, and the like before they complete their academic subjects. There is one government school for toy making and cane working specifically. It should evolve to include manufacture of rubber, plastic, and machine toys. There are special technical high schools to prepare the ground for entry into the G.T.I. now and these schools feature subjects like mathematics, general science, chemistry and physics, technical drawing, shop metal, auto mechanics, etc. Beside these schools there are artisan training schools that offer electricity, motor mechanics, machine shop, blacksmithing, mechanical drawing, and print reading. Because of Burma's peculiar problems, these schools are not seriously considered by the brighter students who still prefer government employ or a college education in theoretical pursuits. Schools enjoy a poor reputation locally too, since their products are considered by the already practicing artisans as inferior. The government has to admit 5th graders currently because they can't attract enough students to fill the program. The apprentice system is highly regarded by old-time craftsmen because it produces a highly specialized worker — extremely narrow in his talents and imagination, but extremely productive (by their standards) and dependable. The student artisans are taken by most small industries only grudgingly. Some of the new schools are still understaffed, and certainly underpaid, which accounts for certain student deficiencies, but the direction is clear. It is hoped that the ideal condition will be realized soon of allowing diversification in technical, agricultural, or vocational education to occur after passing the 7th standard with the advantage of previous industrial arts experiences. Enormous obstacles have had to be faced. One school I visited in central Burma proper had opened in 1938, closed in 1941 due to the Japanese invasion, opened in 1946 just before independence, closed in 1948 as the rebellion got under way, opened in 1951 with a degree of peace established, but closed sporadically as the town was overrun during the ensuing six years. They have a very good idea of what kind of shop work they need and with what tools they should proceed to bring practical industrial skills and products nearer to realization. Now, the long insurrection seems to be nearly at an end and new schools and missing subjects are being added yearly. Founding, molding, welding, and many of the more urgently needed courses for the larger urban centers have come into operation just recently. I felt a gap only in the matter of stimulating more originality of thinking. It seemed that exploratory shop experiences were unduly

limited where I taught, and co-operative effort among the students was reduced to a minimum. A start was made to change this with the construction of an enormous working model of the college by the students and teachers of the school. The current courses should provide more exploratory shop experiences, encourage originality in method wherever practical, and in design. The students in industrial-arts programs on the secondary level and in the teacher's training schools should be allowed to do things more for the satisfaction of their creation at this stage. I think this would make the whole business of manual-arts training more appealing and eventually more serviceable.

TWO METHODS OF TEACHING TECHNICAL AND GENERAL RELATED INDUSTRIAL-ARTS INFORMATION

G. KENT STEWART

Eastwood Junior High School

Indianapolis, Ind.

This study was conducted by the author for the purpose of improving instruction in the industrial-arts woodworking area.

It involved a general woodworking class which met five 55-minute periods per week for 18 weeks.

Problem

The problem on which the study was based is that much technical and general related information is taught to shop classes by a series of textbook assignments followed by a question and answer period or lecture led by the instructor. This method very often does not give satisfactory results.

It seems to the writer that related information can be more easily taught by the instructor and better retained by the student if it is taught from a concrete rather than the widely used and accepted abstract and bookish point of view. It also seems that the student who solves his assignments through a concrete method will have learned more than the student who solves his assignments through the instructor's discussion or lecture.

For the purpose of this study, the class was divided randomly into two groups. The first group (hereinafter referred to as group *A*) was taught by the traditional method and the other group (hereinafter referred to as group *B*) was taught by an experimental method of teaching related information in woodworking.

The members in group *A*, the traditional group, were given the same weekly assignments as the members of group *B* with the exception that group *B* members were sent to the shop to work out the assignment with the tools and materials on hand. The members of group *A* on the other hand, remained in the classroom and participated in the lecture-discussion session led by the instructor. Both groups, however, were given ample time to read the assignment and prepare any notes they wished to before they undertook to answer questions concerning the assignment.

Each weekly assignment was followed by a single written examination covering the material presented in the assignment.[1] A weekly record was kept of the mean scores of both groups on each of these weekly examinations. At the end of each six weeks' period, the mean scores were totaled and the mean score extracted. No six week end examinations were administered. At the end of the 18-week semester the means of the six week mean scores were extracted. A final examination was then administered to both groups and their mean scores found. The mean of the six weeks mean scores and the mean of the final examination scores were then averaged and this answer was employed as the final instrument of comparison in deciding which method of teaching had produced the best group score.

[1]Both groups were given the same examinations throughout the experiment.

PROJECT EVALUATION SHEET

Name of Student _____ Project _____

	Possible	Student	Teacher
I. Knowledge, acquired and applied			
A. Neat, accurate plan sheet	4		
B. Ability to use acquired information	3		
C. Ability to follow instructions	3		
D. Ability to use working drawings	3		
E. Discusses problems intelligently	3		
II. Effort and desirable habit formation			
A. Perseverance, finishes projects started	5		
B. Ability to work "on his own"	5		
C. Dependability	4		
D. Industrious, does not waste time	4		
E. Attendance	2		
F. Uses good English in speaking and writing	3		
G. Dressed for shopwork, clean apron	2		
III. Desirable attitudes			
A. Co-operation with students and teacher	5		
B. Attitude toward work	4		
C. Uses equipment properly	5		
D. Good behavior, obeys rules	4		
E. Observes safety precautions	4		
F. Does not waste materials	4		
IV. Quality of work			
A. Accuracy as compared with ability	6		
B. Accuracy as compared with class average	3		
C. Quality of the finished product	5		
D. Project is well designed, looks good	4		
V. Quality of work, miscellaneous factors			
A. Accomplishment as to ability	6		
B. Accomplishment as to class average	3		
C. Personnel duties	4		
D. Extra work for service of shop	2		
Totals		____	____

Point-Grade Scale

90 — 100 points — A
80 — 89 points — B
70 — 79 points — C
60 — 69 points — D
Below 60 points — E

A new service station road map usually represents an investment of more than $20,000 before a single copy is printed for distribution. — *Petroleum Newsnotes.*

Industrial Arts and Vocational Education

JOHN J. METZ, Editor

GREATER SINTERING CAPACITY INCREASES STEEL PRODUCTION

SINTERING makes use of fine iron ore particles and flue dust and agglomerates it into large porous lumps for use in blast furnaces. These fine particles of ore, together with coke breeze are blown through a sintering plant where the heat fuses them into large clinker-like lumps. Sintering makes available iron ore which could not be used otherwise because of its physical characteristics.

Sintering plants help boost blast iron production and reduces operating costs. With sufficient sintering capacity four blast furnaces can produce as much iron as five without the sintering capacity. Sintering also reduces coke consumption.

By the end of 1958, 15 new sintering machines, with a combined annual output of 20.7 million net tons, will have been completed. Other plants also are under construction which will be finished for use next year.

During 1950 to 1956 inclusive, 19 new plants were built with a combined annual capacity of about 14 million tons.

Two of the new sintering machines are 12 feet wide, the first in the world of such a size for ferrous materials.

Other features in modern sintering plants include automatic mixing and sizing devices for controlling the sintering mixes. All waste gases produced by this process are thoroughly cleaned before being released in the atmosphere. One sintering plant, with a daily capacity of about 2500 tons, cost $7,000,000.

In the years 1958 and 1959, the amount of new sintering capacity will probably exceed the total built during the 30-year interval between 1920 to 1949 inclusive, when the capacity rose about 24.8 million tons through the construction of about 60 such plants. The first sintering plant was built in this country in 1911.

The year of 1958 has seen much modernizing of existing equipment and installing new facilities, despite the recession in the early part of the year. Among the capital improvement programs — started, finished, or in progress during 1958 — are the following:

Approximately 20 rolling mills of various types and sizes such as blooming mills, slabbing mills, hot strip mills, structural mills, and cold rolled sheet and strip mills. Most of these are new. Others are rebuilding projects.

Eight new steelmaking furnaces, mostly electric units, plus the enlargement and rebuilding of several furnaces. A new oxygen and steel making plant, the largest in the world completed and ready to operate. Another large plant is being built. In order to keep pace with the growing use of oxygen in the iron and steel industry, a record number of new, highly automated oxygen producing plants has been constructed this year by oxygen companies on sites close to steel plants.

Five large, new, continuous annealing lines for speedily annealing steel strip without a halt. Each of these facilities are hundreds of feet in length. One is so tall that an elevator is required to carry workers to its railed-in top.

Four coke oven batteries, several new pipe mills, a new battery of soaking pits, a new coal cleaning plant, an iron powder plant and several giant ladles have been installed.

Numerous pilot mills and pilot plants several of which are engaged in direct reduction of iron ore, whereby the ore is partially reduced without being reduced to the liquid state.

The completion and operation of all the facilities of a new $300 million taconite project in Minnesota, including its railroad and shipping port were installed. The first taconite pellets were produced by this plant over a year ago.

These activities of our steel industry in its low output period created jobs, modernized mills, and aided economy.

Much of the material contained in this editorial was taken from the December, 1958, issue of *Steel Facts*.

THE SAD CHICAGO CONFLAGRATION

THE fire which swept through Our Lady of the Angels Roman Catholic grade school at Chicago on December 1, 1958, and which took a toll of three teaching Sisters, and some 89 children, besides causing injuries to about 100 others, will not be forgotten very soon.

The fire spread so fast that pupils and Sisters were trapped because of the terrifying swiftness with which the fire destroyed the staircases and made the second-floor corridors and normal passages impassable.

The suddenness with which this catastrophe took place should awaken all school officials, teachers, and janitors to the need of strict supervision. Shop teachers especially should see to having their shops in order that fires if they occur can be efficiently handled.

Have your students fully instructed on how to get out of the shop if a fire breaks out in that room. Have passageways uncluttered with lumber, materials, and debris.

Have all oil, paints, varnishes, gasoline, and other flammable liquids in closely stoppered bottles and cans. Have a water supply handy for putting out fires. Have several ladders long enough to reach from the shop windows to the ground. Many of the children at the Chicago school fire were severely injured when they tried to escape by jumping from the second story.

Have your fire extinguishers in good order. Inspect them frequently. Get your students out of the building as soon as possible when fires break out, and have a garden hose in the shop which can quickly be attached when needed. Pray daily that you, your school, and your students be spared such an experience as that of the Chicago school.

SEASON'S GREETINGS

JANUARY 1, 1959, is just in the offing. It has been customary for centuries to wish others good luck at the beginning of a new year. World conditions as they are almost makes it seem a mockery to wish others a Happy New Year.

It is very difficult to become enthusiastic about conditions that confront not only the countries of the old world but also the lack of friendliness that exists between us and other countries in South America, Asia, Africa, and Europe.

No matter what our government has done for Russia and the other European countries, little appreciation has been expressed by any of them and even our allies in World War II seem to look upon us with suspicion.

Russia, China, and their communistic friends quite openly express their hatred and distrust against us. Under such conditions there can be little good will between us and the rest of the world.

But between INDUSTRIAL ARTS AND VOCATIONAL EDUCATION readers there exist, it is to be hoped, the same good feelings as in the past.

Therefore a Merry Christmas and a Happy New Year to all the shop teachers in our schools.

Problems and Projects

18-IN. SOLID CATBOAT MODEL — MARCONI RIG

JOSEPH A. THOMAS
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Ridgewood School
Rochester, N. Y.

Materials

A. Piece of sugar pine (free from knots) 1½ by 4½ by 18 in.

B. Piece galv. iron (18 or 20 ga.) 6 by 7 in.

C. Piece sheet brass (half hard) for mast step and rudder 3 by 3 in.

D. Maple doweling for mast ⅜ by 18 in. long.

E. Maple doweling for boom ¼ by 10 in. long.

F. Brass rod (half hard) for rudder bar ⅛ by 3½ in. long.

G. Brass rod (half hard) for mast spreader bar ⅛ by 3 in. long.

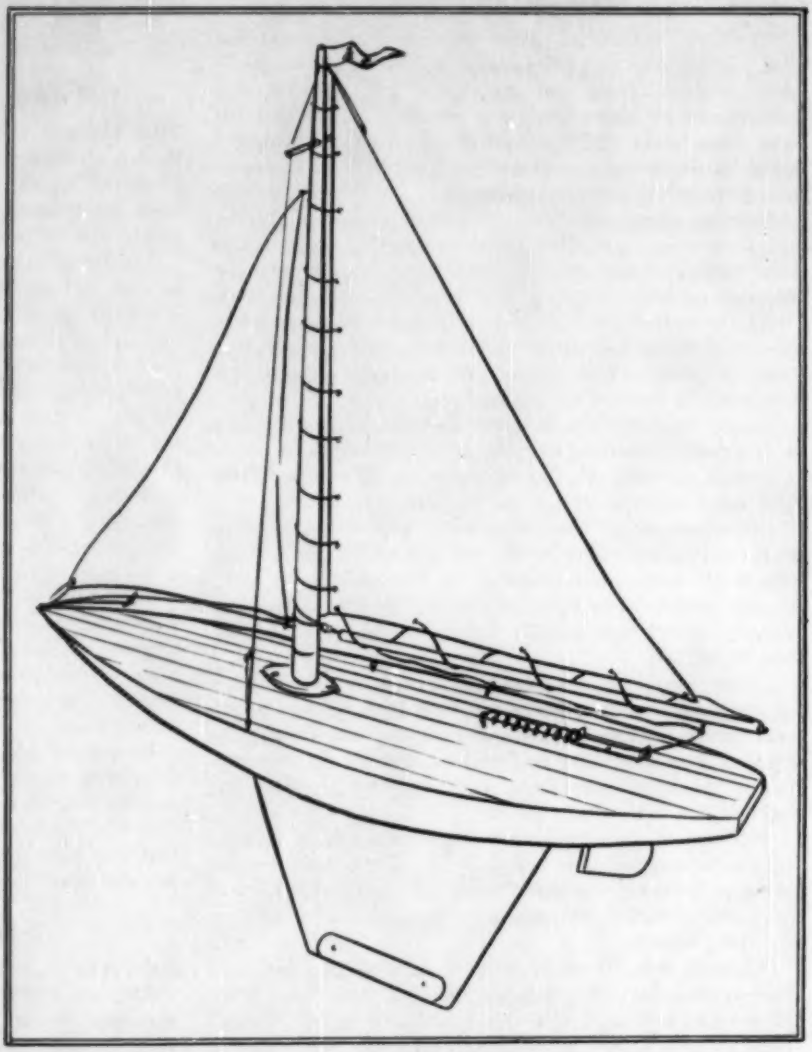
H. Broadcloth for sails (white or colors) see attached details.

I. Eyelets for sails — No. 354 regular
1. Available from United Shoe Machinery Co. — Shelton Eyelet Division — Shelton, Conn.
2. Gifford Hand Set Holder for use with eyelets. Also available from United Shoe Machinery Co.

J. Brass screws 4 R.H. by ½ in.

K. Screw eyes No. 214 — ½ in. bright steel or brass.

Model catboat cradle



Marconi rig for 18-in. catboat

L. Parcel post twine for rigging.

M. Plastic sheet 1/16 in. thick for use as braces with rigging.

N. Brass tubing (half hard) for mast step ⅜ in. I.D. by 1 in.

O. White shellac.

P. Enamels.

Q. Sandpaper — assorted grain.

R. Small typewriter spring — to apply tension to tiller bar.

S. Lead for ballast — approx. ½ lb.

T. Aluminum rivets ⅛ by ¾ in. — attach ballast to keel.

U. Clear lacquer and lacquer thinner — for use on brass parts.

V. Soft solder and flux.

W. Lumber for boat cradle — ½ in. poplar or pine.

Procedure for Making Boat

A. Draw full-size patterns for top and sides of boat.

B. Trace top pattern on wood and cut to shape.
1. Sides should be smooth and square with top of hull.

C. Draw side pattern on hull and cut to shape.
1. Bottom should be square with sides of hull.

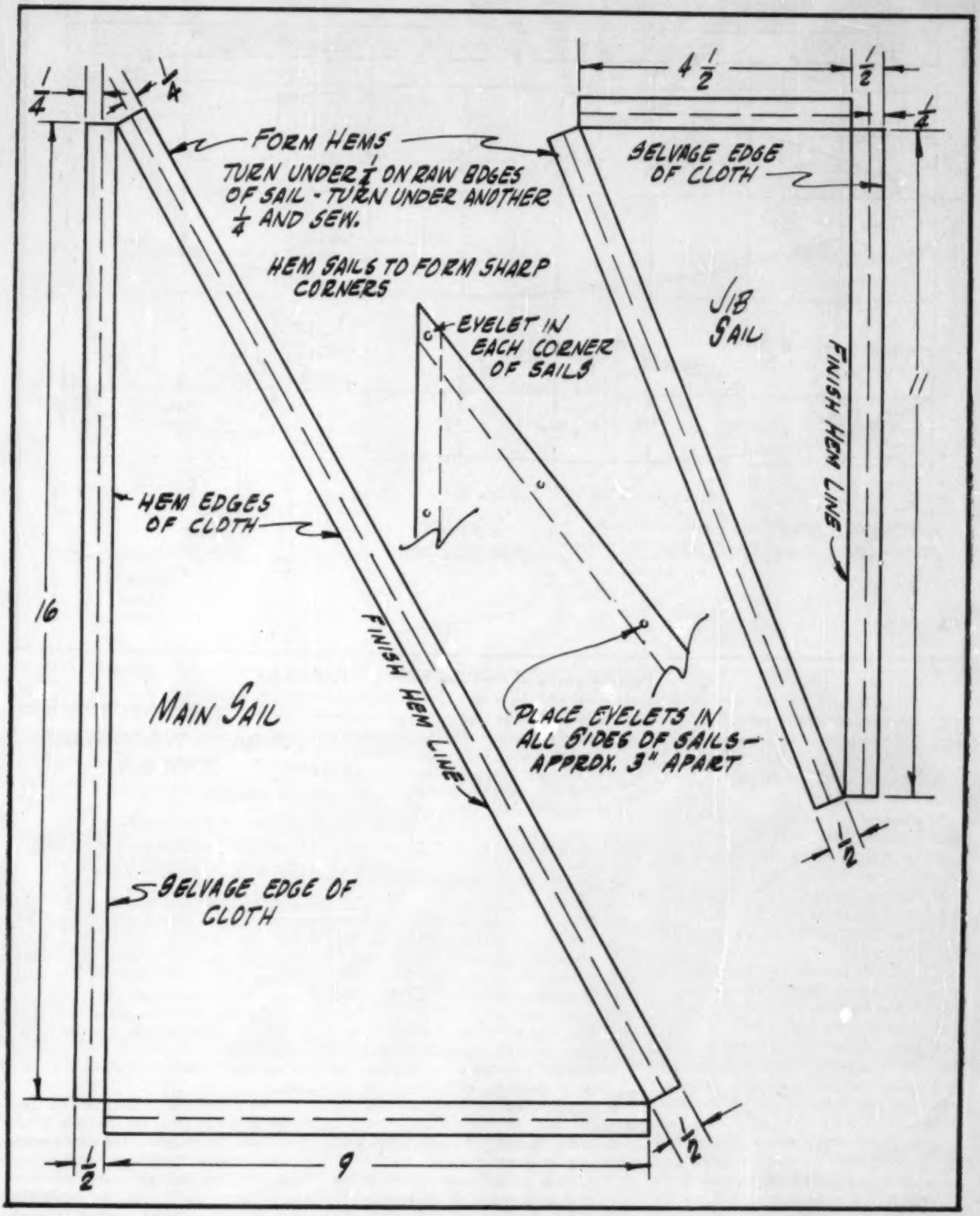


Fig. 3. Details of 18-in. catboat sails

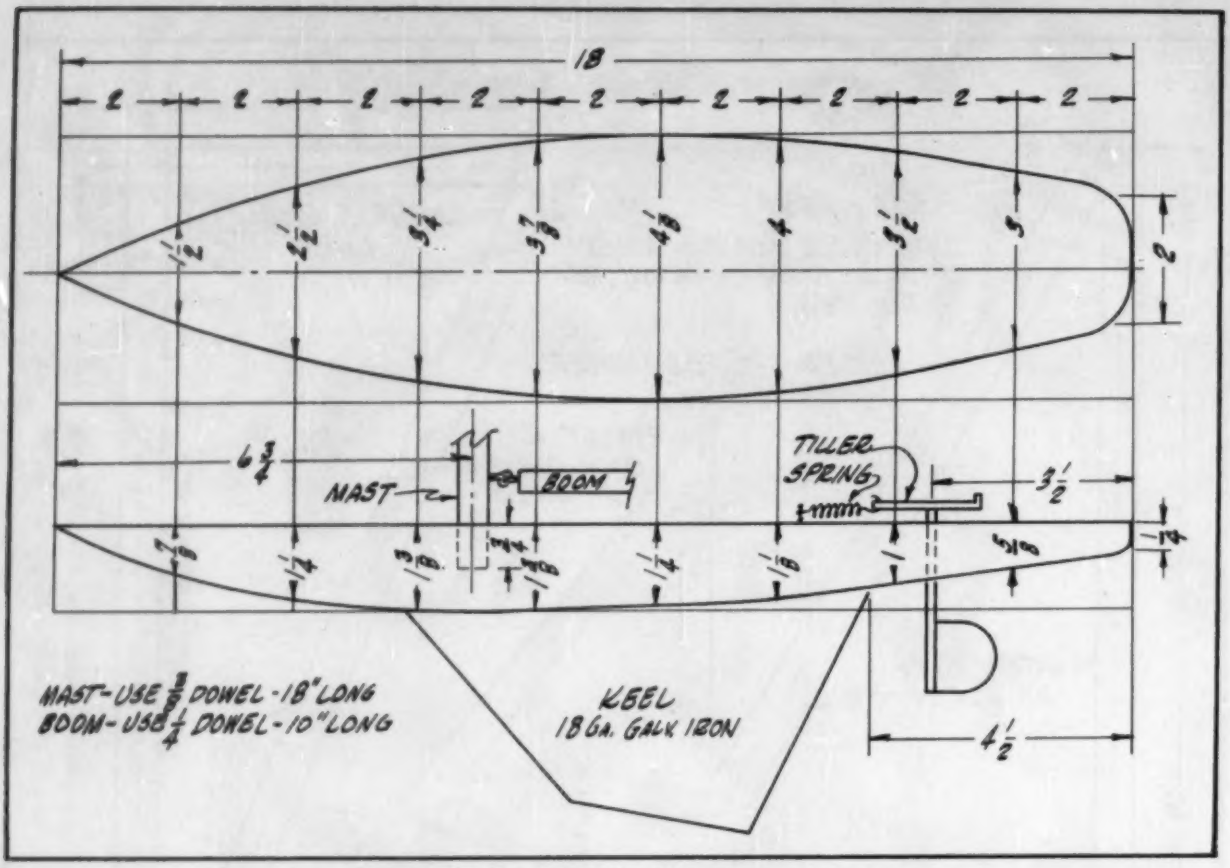


Fig. 1. Detail drawing of the 18-in. catboat — Marconi rig

D. Form bottom edges of hull to desired shape both fore and aft.

1. All bottom edges to be rounded and brought to sharp point at front and square at rear of boat.

E. Leave section at base of hull flat to receive keel as shown on detail.

F. Mark and drill rudder post hole and at right angles to top of deck.

G. Lay out keel on galv. iron and cut to shape — attach to hull.

H. Cast 2 pieces lead for use as ballast and rivet to keel.

1. Wood patterns to be made as shown on details.
2. Use molding sand or plaster paris for pouring lead.

I. Deck may be scored or marked with lines ¼ in. apart to imitate planking.

J. Make mast step using sheet brass for the plate and brass tubing for the mast holder.

1. Sweat solder parts together and drill holes to attach to deck.
2. Clean, buff and apply clear lacquer.
3. Attach to deck.

K. Make rudder-bar and rudder as shown on work sheet — solder together.

L. Make tiller bar as shown on work sheet.

1. Insert rudder-bar through deck and soft solder tiller bar to rudder placing small brass washer between tiller and rudder for deck clearance at this point. Be certain to position tiller and rudder so both line up with prow of boat. Clean and apply clear lacquer to all brass parts.

M. Attach spring to deck and tiller bar as shown on work sheet.

1. Allow tension so spring will hold rudder in position.

N. Make mast to size — taper to top — drill hole for mast spreader.

O. Make boom and attach to mast using small screw eyes.

P. Make plastic braces for use to apply tension to mast stays.

Q. Attach screw eyes as necessary to rig boat as shown on work sheet.

R. Apply finish to hull and keel as desired.

S. Make necessary boat cradle to hold boat in position while rigging.

1. Make to fit boat and shape tops of end pieces to fit hull.

T. Cut out sails — sew and install eyelets as shown on work sheet.

U. Rig sails as shown on work sheet. Allow for position of sails to catch wind.

A BASIC WOODWORK TOOL KIT

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Listed here are the advantages for having the basic woodwork tools in tool kit form:

1. The improved safety factor in the carrying of tools to and from the main tool panel.

2. Because the basic woodwork tools are carried in a tool box, not only is the accident risk decreased, but also there is less damage to tools through careless carrying.

3. By not having to make several trips to the main tool panel for the basic woodwork tools, the discipline, the time wasted, and the accident hazards are reduced.

4. The tool kits are numbered from one to twenty-four, as are the bench stations. Thus the student working at bench station ten uses tool kit No. 10.

5. By having the special tools and the twenty-four basic tool kits divided be-

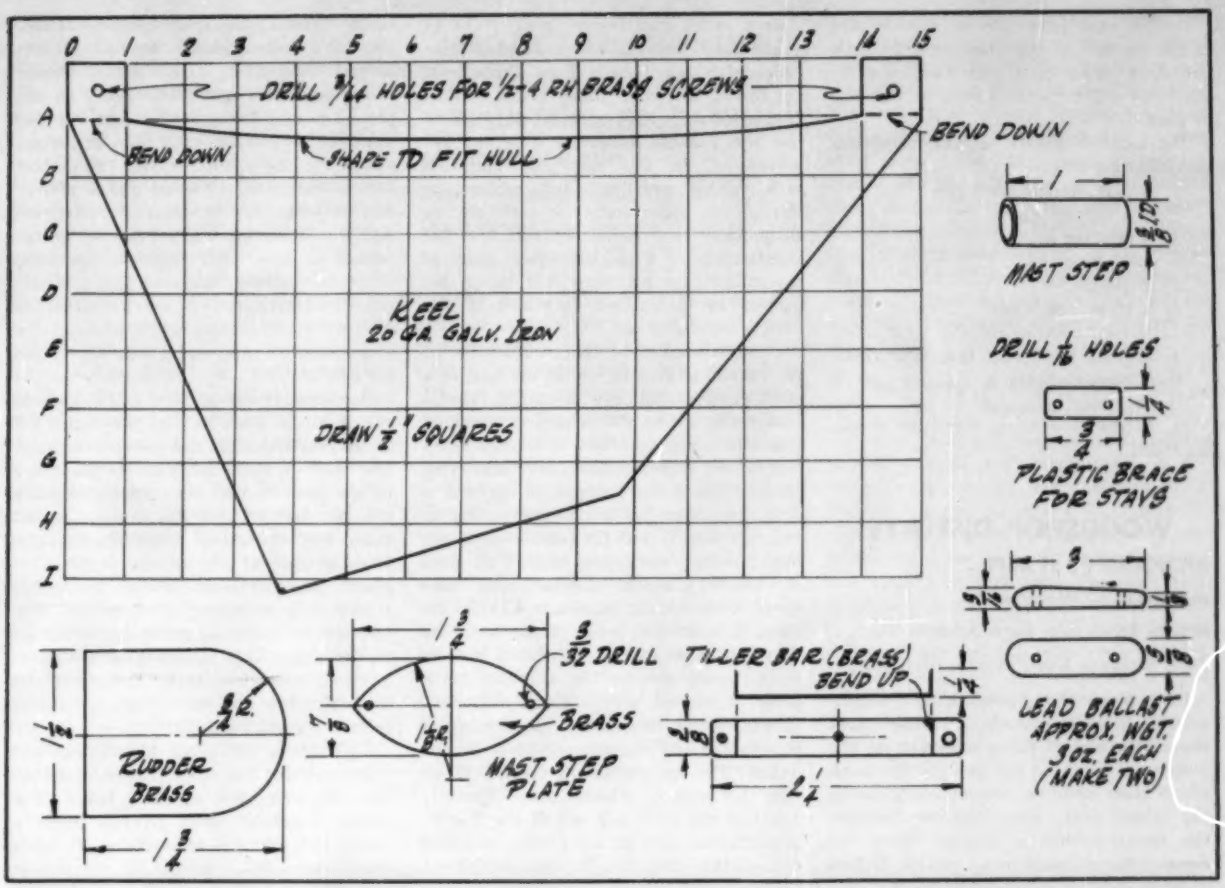
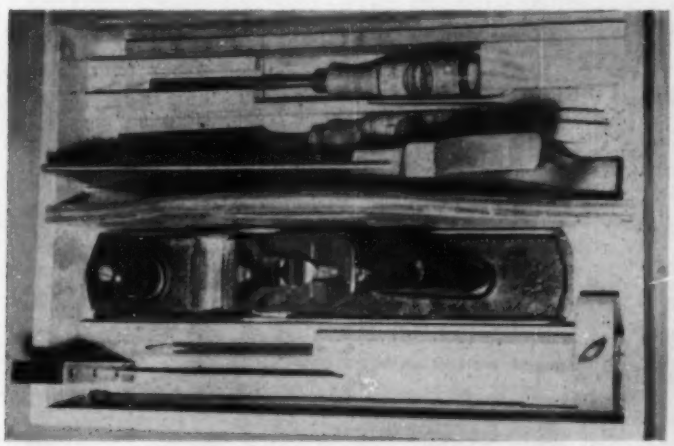


Fig. 2. Keel, rudder, mast step, and lead ballast. (See article on page 14)



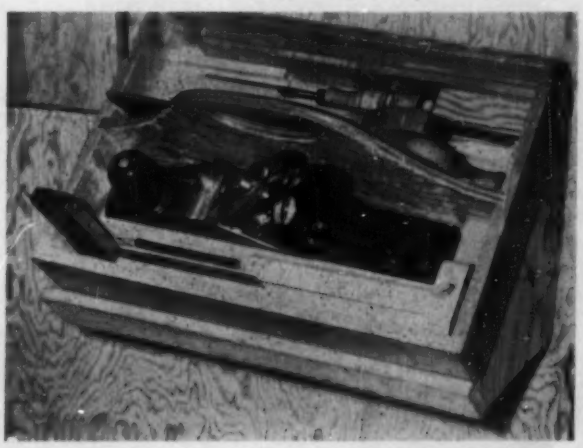


Fig. 1. Basic tool kit by S. A. Perkins. Fig. 2 (right). Basic tool kit at the bench

tween two main tool panels, it allows twelve students to work from each panel, and consequently improves distribution and discipline problems.

6. By having to make only the one trip to the tool panel at the end of the period, the clean-up time is shortened.

7. If a basic tool is missing, the student responsible is immediately known.

8. With the basic tools in numbered tool kits, it is easy for the instructor to know which tools he has sharpened, i.e., tool kits 1 to 6 before school, and 7 to 12 after school, etc.

9. The student takes a personal interest and pride in the tool kit, referring to it not as tool kit No. 10, but as "my tool kit."

10. By having the tool kit fit on to a sloping shelf at the end of each bench, it provides a place to store unwanted tools during the varying operations, and consequently, provides a greater working area on top of the bench.

11. The tool panel can be quickly and easily checked at the conclusion of each period, and when fitted with a sliding door, the tools can be locked away at the end of each day.

The basic woodwork tool kit comprises the following tools:

1. A 2 ft. folding steel rule
2. A 6 in. try square
3. A marking gauge
4. A jack plane
5. A pencil
6. A 10 in. bench saw
7. A 1-in. bevel edge tang type chisel
8. A ½-in. bevel edge tang type chisel
9. A marking knife
10. An eraser
11. A pair of winding sticks for checking twist.

WOODSHOP DISPLAYS

NICHOLAS P. STUMPF
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Maine Township High School
Park Ridge — Des Plaines, Ill.

In your school and mine there is usually an all school exhibit. It is usually held toward the end of the school year for the purpose of showing the parents the work which their children accomplished during the school year. Some teachers consider the annual exhibit as another chore and do as little as possible to get by. Others view it and use it as it was devised and intended. Here is a fine way to secure a better understanding between the home and the school. In short this can be public relations of the finest kind.

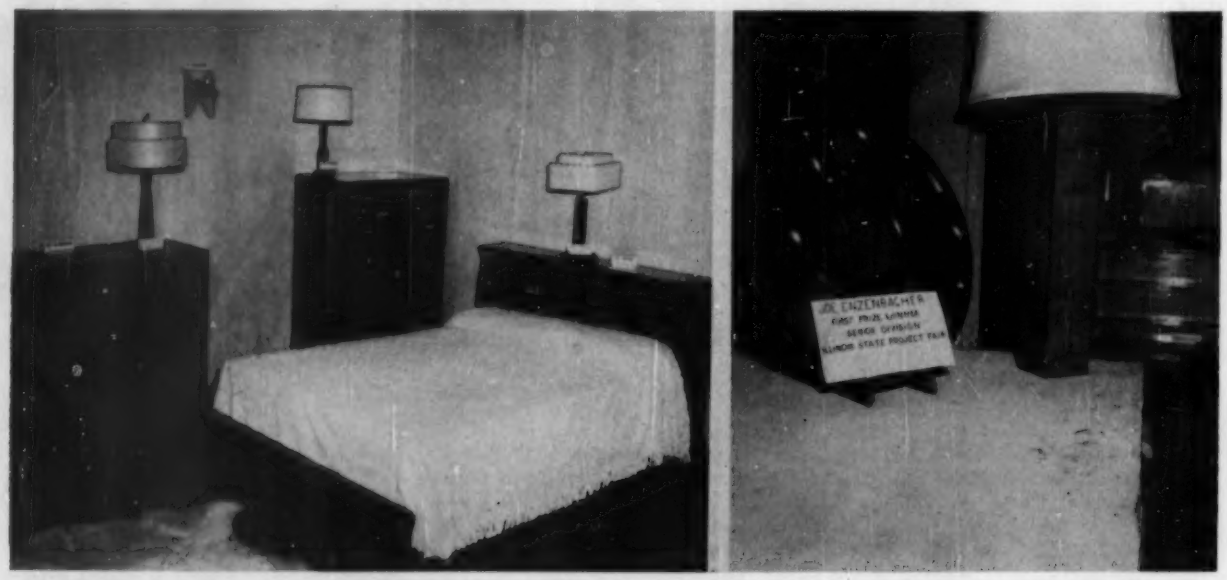
As a young man beginning my work as a woodshop teacher, I formulated a principle by which I have lived throughout my career. The rule simply stated is this. *"I shall display the work of my boys to the best possible advantage at every opportunity."* In this spirit we approach each exhibit with zest and enthusiasm. Here is an opportunity for each boy to shine. Here is a chance to reap the full satisfactions of a job well done. Here is recognition, for his name will be on his project for Mom and Pop and all the family friends to see.

I am convinced of the effectiveness of the exhibit as I recall one of my first in a small grade school shop in central Illinois. I have always felt that a project springing from the needs of a boy is a more effective project than the fixed assignment type. In this light a boy approached me with a sketch which he had made, representing an ordinary box. It was far from an ordinary box, however, since it contained all sorts of secret drawers, compartments, and areas, with various ingenious locking devices. I asked him what in the world he would do with such a contraption and he replied quite simply, "It will give me a place to put my stuff." There was much interest in this box during the evening of the exhibit. Much interest of a lasting nature. The box was simply labeled, "Stuff Box" for want of a better name. Recently I visited the town and one of my friends, a gentleman now in his fifties, reminded me of the stuff box in that exhibit. A tribute to the effectiveness of this epitome of understanding between every grownup and every boy who ever lived. "A place to put my stuff."

A spectacular exhibit is based upon one simple artistic principle. Directly stated, you can't make a display without a background. Bare walls, clamp racks, lumber racks, machinery and workbenches do not present a good background for an effective display. They take away the important element in the picture — from the project that is exhibited. Plywood makes a very fine material for blocking out the unsightly, and for building settings for groupings of projects. With the fine co-operation of my department chairman and our purchasing department, I am permitted to buy my yearly supply of plywood in the spring and in this way I can use it for the exhibit.

Passageways are so that traffic goes in one direction and projects are roped off to prevent handling and possible damage. The show is given unity as people move to the rear of the shop where they see the raw lumber and the projects in all stages of construction. Every phase of the work is made a part of the display. Ingenuity is a fine asset to a teacher and is a great help in setting up an exhibit. The bedroom set is placed at the very entrance to the shop. This makes it necessary to stack all tablet arm chairs along with the teacher's desk and the library bookcases behind a plywood wall.

Lighting is of great importance and where possible the room should be lighted with the soft glow of table lamps. The glaring overhead lights do not create a warm and gracious atmosphere. It takes about three dozen lamps for my exhibit and they are all the product of the students in my classes. Remember there is no permanence in this structure and nails should be left protuding so that they may be easily drawn. The corners make the



Bedroom set shown at the entrance of the shop. At right, a lazy susan that attracted much attention at the 1957 display

walls stand almost without further support. It takes one day to erect and arrange the entire show and it comes down in less than two hours. Classes are normal in the shop by ten the next morning.

I have always had the finest co-operation on the part of the students and parents in the return of projects for the open house. Many a boy has slept on the floor so that his bed could be shown in the exhibit. Many households are disrupted but the people are willing because they are proud to be a part of the spectacular.

As the teacher I prefer to remain in the background. The only thing which I have in the exhibit is evidence of the quality of my instruction. I would not stoop to place any project of mine on display and take away glory from my boys. I have Dad and Mother host and hostesses to greet visitors at the door. Students guide and help people through the shop and answer any questions they may have. This gives me a chance to visit other fine exhibits throughout the school.

During the three hour period of the open house the woodshop is never empty and frequently people are waiting in line to get in. It may be said that most of the people who visit the school find their way through the woodshop exhibit during the evening whether they have boys in the classes or not.

PROJECT RELATIONSHIP BETWEEN SCIENCE AND INDUSTRIAL EDUCATION

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Los Angeles City Schools
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Some people claim there is little relationship between science, mathematics, and industrial education. Others contend that there is complete interrelation. Leaders in industry have recently expressed definite opinions on this matter. The general feeling among these leaders is that every potential engineer or scientist must have a background in shopwork if he is to be an effective engineer regardless of the field of specialization. Practical experience, as given in electric, metal, auto, and woodshops is a valuable asset to any prospective engineer, these experts say. Although these courses in industrial education fulfill the needs of industrial arts and vocational education students, certain projects can be developed to attract and meet the interests of science majors. One of these projects is described here. There are many others that can be suggested by science and mathematics teachers. Many science and mathematics experiments can be made more effective by building apparatus for the experiment in shop classes. The author has encouraged science students to work in his shop during lunch period so that they could build their projects for the annual science fair. The activity proved to be so popular that there were as many students working in the shop during lunch time as there were enrolled in the regular classes. As a result of this a workshop for science students was organized as a regular class within the industrial-arts program of the school.

The Project: A Single Lens Solar Furnace

A solar furnace is easy to make and has proved popular and effective. It is designed with a single lens mounted on a plywood frame as shown in Figure 1. Wood side supports are fastened to the underside of the frame to support the entire furnace or work area. The work area is adjustable and may be moved toward or away from the lens as a temperature-and-focus control. The sides are graduated and "the scientist" may work out a code or schedule so that he can set the focus according to the time of day or month. The worktable is adjustable so that it is always level.

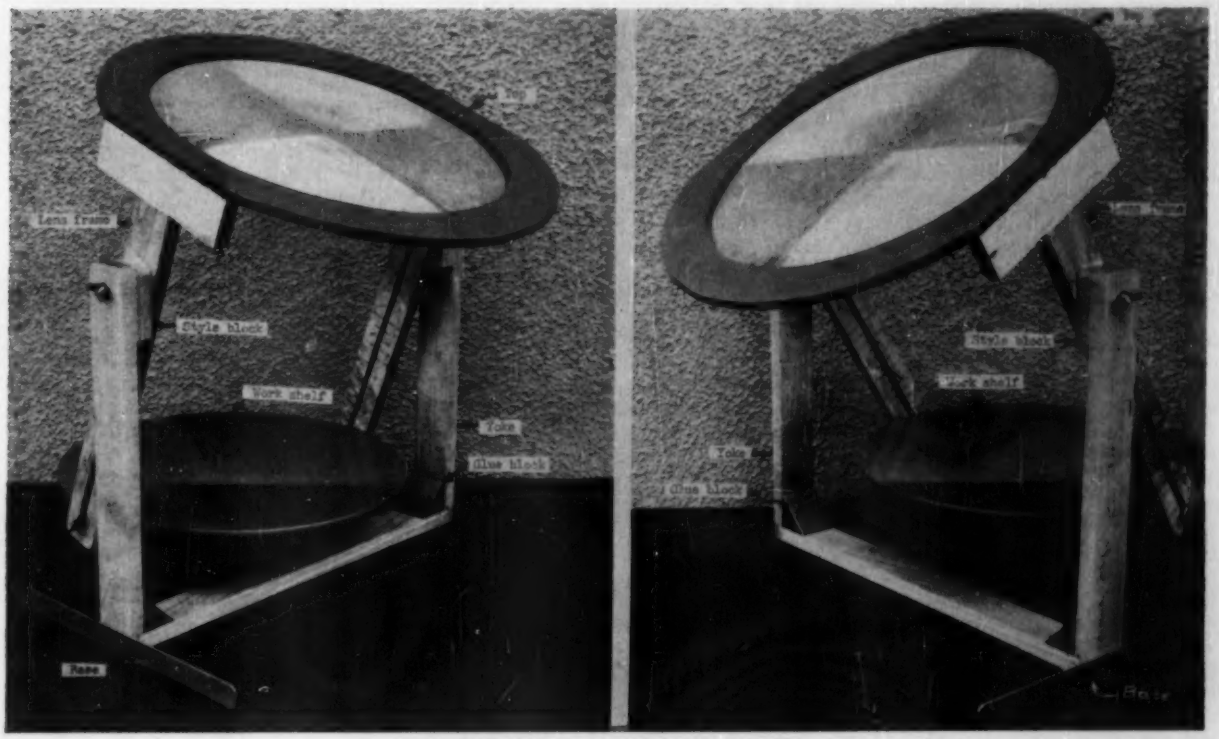
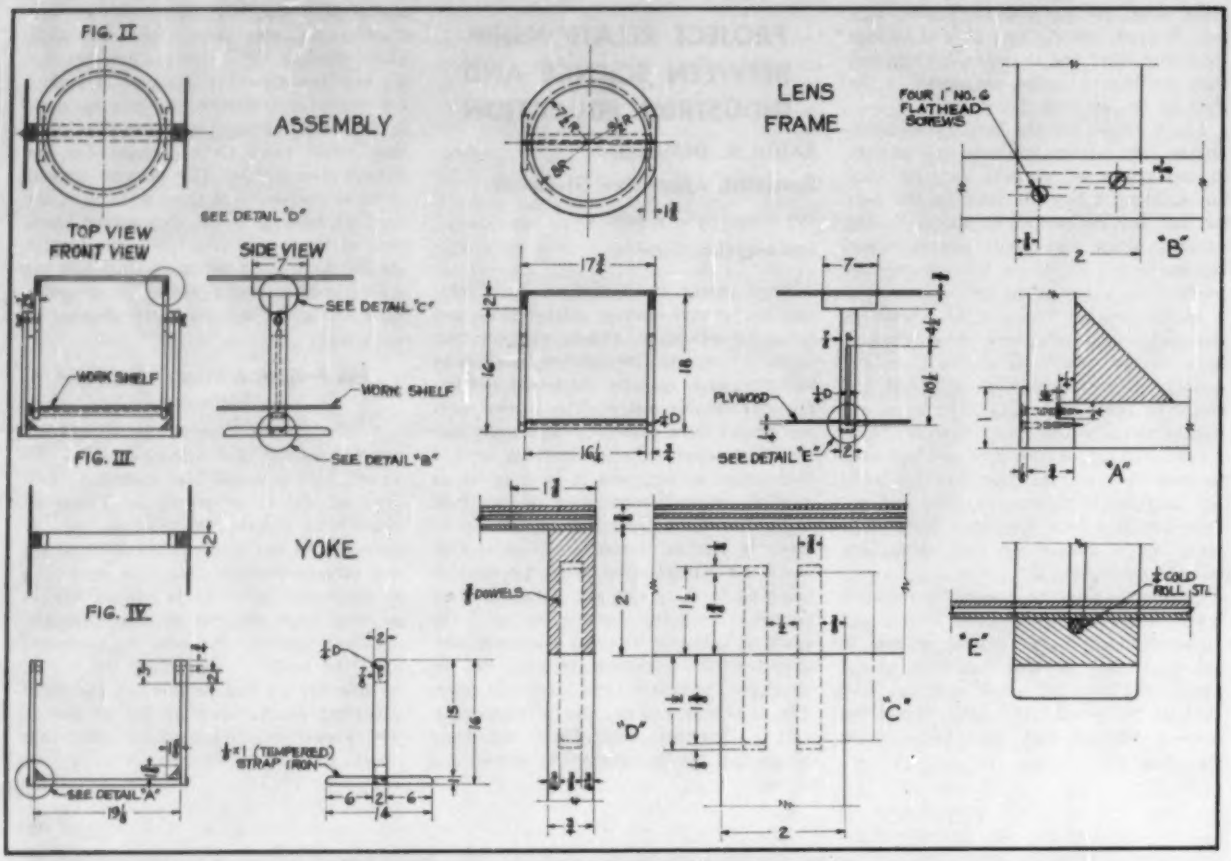


Fig. 1

— Photos, Photography Department, Los Angeles City Schools



Detail and assembly of the solar furnace

Method of Construction

Make the lens frame first (Figure 2). A piece of ½-in. plywood (hardwood, to insure a smooth surface for lens mounting) is satisfactory. Locate the exact center of the plywood approximately 20 in. square and mark off a circle 14¾ in. in diameter. Draw another circle from the same center 18¾ in. in diameter. First, cut out the center on the jig saw and then the outer rim on the band saw. At two ends, cut off a flat area 7 in. long. See Figure 3 side view of lens frame at "C."

The frame is made of hardwood and consists of five pieces. Refer to stock bill. The two top rails are glued and dowled to the styles. Before gluing, a slot ¼ in. wide should be cut into the styles 1 in. from the bottom and 4½ in. from the top. (See E.) Cut a ¼ by ¼-in. groove the full length of the bottom rail (see E detail) to receive the ¼-in. cold-roll steel which is to be threaded on both ends. First glue the top rails to the styles and when dry, plane and sand even. Next, cut a ¼-in. piece of plywood 16 in. in diameter and glue to the bottom rail which is cut 16¾ in. long. Glue this assembly to the top frame after the rod of ¼-in. cold-roll steel has been installed. See details D, C, and E.

The Yoke

This should be made strong because it gets the most strain. It consists of two styles, one bottom rail, two style blocks, and two glue blocks (see stock bill). After all pieces have been cut the proper length, a ¼ by 14-in. groove is cut across the styles ¾ in. from the bottom. Cut a tongue in the rail ¼ by ¼ in., to fit the groove (see detail A). Next, glue the style blocks 2 by 3 in., against the styles even to the top. When dried, sand even and bore two ¼-in. holes 1 in. from the top. Countersink on the inside of the frame to receive the bolt head. Then assemble the styles to the rail. Check for square and install the glue blocks (see detail A).

Be sure that this assembly is perfectly square. After this assembly is dry, plane and sand even and prepare the metal piece which holds the entire project erect. This is the base and is made from a piece of strap iron ⅛ by 1 by 14 in. (see stock bill and photo). Use 1-in. No. 6 flat head screws to fasten to the yoke (see detail A and B). Install the stove bolts through the lens frame and yoke on both sides. Tighten the wing nuts. Put wing nuts on the work shelf and the entire project is assembled. If hardwood is used the project may be finished natural, either with lacquer or varnish.

Installation of the Lens

For this particular project a EDSCORP Fresnel Lens was used, obtainable from the Edmund Scientific Co., Barrington, N. J. It is very important that the finish be allowed to dry at least 24 hours before installation of the lens is started. To fasten the lens to the frame, coat the bottom of the frame with Goodyear Plyobond adhesive or equivalent. Gently place lens with segment side *down*, against the rim and let it settle. Do not smear any of the adhesive on the segments of the lens. Do not attempt to stretch the lens in trying to tighten it, because the lens will automatically become taut when the adhesive dries. CAUTION: *Do not use household or airplane cement. These adhesives will dissolve the plastic lens.* Allow the adhesive to dry at least 12 hours before handling the lens. After the adhesive is completely dry, trim the edges close to the frame with a razor blade. CAUTION: These Fresnel lenses are extremely powerful,

since their effective speed is approximately f/1.0. Any combustible material that is near the focal point, with the lens pointed outward to the sun, will more than likely burst into flames. When carrying the lens in the sun either have it rolled or covered with opaque material, or in a position where you are between the sun and the lens.

Cleaning the Lens

The manufacturer recommends the following procedure in cleaning the lens: Do not wash the Fresnel lens any more than necessary. To clean the lens, first dust it with a camel-hair brush as follows:

1. Brush the lens clean of dust by using a circular motion.

2. If any fingerprints or stains are noticeable after brushing, wash the lens with a piece of absorbent cotton soaked in a cool mild solution of nongritty detergent, ammonia, and water. Use a circular *motion* in washing just as in brushing.

3. Wash only a small portion at a time, using new cotton frequently to prevent accumulation of abrasive particles.

4. If the cotton becomes too dry, the lens may become scratched from a pile-up of abrasive particles.

5. Wash the lens twice in the same manner as above, but use cool clear water.

6. Dry the lens with a large piece of clean absorbent cotton, using a circular motion.

7. Remove any lint from the surface with a camel-hair brush.

SOLAR FURNACE
Stock Bill

No. Pcs.	Name of Part	Material	Size
Lens Frame			
1	Top	White pine plywood	⅜ x 19 x 19 in.
2	Top rail	Maple	¾ x 2 x 7 in.
1	Bottom rail	Maple	¾ x 2 x 16¾ in.
2	Styles	Maple	¾ x 2 x 16 in.
1	Bottom shelf	White pine plywood	¼ x 16 x 16 in.
4		Birch dowels	⅜ x 2¾ in.
Yoke			
2	Styles	Maple	¾ x 2 x 16 in.
2	Style block	Maple	¾ x 2 x 3 in.
1	Bottom rail	Maple	¾ x 2 x 19⅝ in.
2	Corner glue blocks	Maple	1½ x 1½ x 2 in.
Other Materials			
2	Stove bolts		¼ x 2½ in.
4	Wing nuts		¼ in.
4	Washers	Brass	¼ in.
1	Cold-roll steel — thread both ends	1½ in.	¼ x 18½ in.
1	Base	Strap iron	⅛ x 1 x 14 in.
4	Flathead screws	Brass	1 in. — No. 6

NO SAG CLOTHES LINE

GEORGE P. PEARCE
Albuquerque, N. Mex.

The trouble with most clothes lines is that every few months they keep developing a bad sag. Tightening the wires does not effect a cure and not only do they soon get saggy again but the posts begin to lean toward each other. The reason for all this bother is that when you tighten the eye bolt and pull each wire taut you generally do this on a warm day. Then along comes a cool night and the four wires contract; this extra shortening causes a tremendous pull at the top of the poles and this pull is multiplied by the long leverage of the pole length with the result that the pole has to bend or the footings have to give way and the next warm day the wires again are sagging and, once more, you retighten them. This keeps on until the posts finally fall. On a 25-foot aluminum wire clothes line the difference in length of the wire between winter and summer can be over half an inch and the pull to establish this will easily reach the yield point of the wire which for four No. 7 wires is a pull of over 750 pounds.

A simple way to eliminate this trouble is just to slip a short length of a strong compression spring under the nut and washer of the adjusting eye bolt which is at one end of the line and is provided to tighten the line. I used a spring which is ⅞ in. outside diameter, a free length of ⅞ in. and four turns of No. 12 gauge (.106 in.) steel wire. The adjusting nut is tightened to compress the spring to a length of ⅝ in. I dipped the springs in a thick oil to protect them against rust. This arrangement has been in use for over six years without adjustment. The photographs show details of the arrangement at the 2 in. galvinized pipe cross arm. The adjusting eyebolt is ¼ in. diameter.

Work accidents cost the nation four billion dollars a year.

AN EFFECTIVE SHOP SAFETY ORGANIZATION

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Bowling Green State University
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Every school shop should have some sort of safety organization for the purpose of safeguarding its students. This system deals primarily with the use of power machinery. No implications are made to withhold the use of power machinery in the shop program, but on the contrary, to teach the safe use of them. It is quite evident that there are always violators of any regulations which often result in injury to students. It is the intent of this organization to reduce to a minimum the number of violators by helping them *to* feel a consciousness of the need for safe use of power machinery.

Steps in the Organization:

1. Each student is assigned a number. This number may be carried throughout the entire activities of the shop.

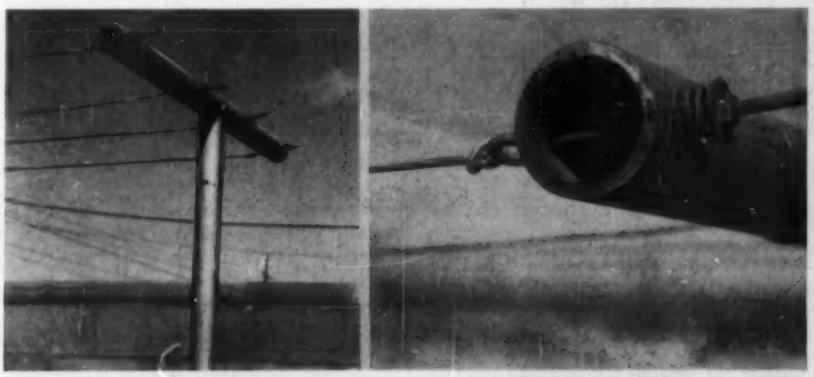
2. A chart is constructed to conform to the size of the class and the number of machines in the shop. Anticipate the largest class and a possible addition of future machines. An example of such a chart made of plywood is shown below.

3. Safety instruction is given to the students as a class, both orally and from printed material. You may have to formulate a set of safety regulations to suit any machinery in your shop.

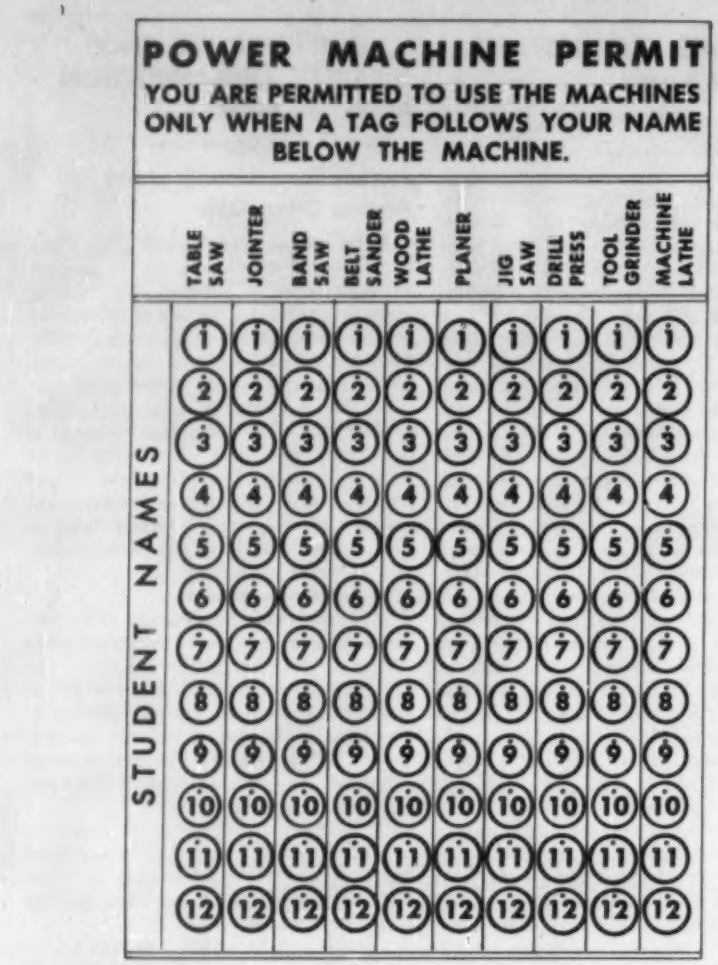
4. The instructor should present numerous safety demonstrations, pointing out the many danger possibilities of each machine. Congruently he should correlate the safe practices to follow in each case.

5. It may be possible to cover two or three machines each week if total time is allotted to this point.

6. A time period of from one to two weeks should be specified for the students to have ample time to study the informa-



No sag clothes line



Safety tag charts

tion concerning the safe use of the machines.

7. When this period is over, test No. 1 is administered to the class on the most commonly used machine in the shop. If the student fails to pass the test by 100 per cent, he will be given extra time to restudy the information and take test No. 2. This test is the same as No. 1, except the material is rearranged on the paper. A third and final test can be prepared if necessary. Follow this procedure until all of the machines in the shop have been covered.

8. An example of the simple test is:

1. It is a safe practice, when ripping on the circular saw, to always use the: (*a*) push stick; (*b*) jointer shoe; (*c*) a piece of scrap metal; (*d*) your fingers.

Answer (*a*)

9. Before the student is permitted to use the machines, he must qualify under the following items:

a) He must have written permission from his parents. (May be a standard form or a written statement).

b) He must attend class lectures and demonstrations presented by the teacher.

c) He must study thoroughly the printed information passed out by the teacher.

d) He must pass the tests by 100 per cent in one to three attempts.

10. When these obligations have been met, a tag bearing his number will be hung on the chart opposite his name and below the machine concerned. This makes him eligible to use that machine. See chart.

11. The teacher should observe the student who is using the machine for the first time, throughout the entire semester, to be sure that he is learning the safe use of the machine and not bypassing any of the safety rules.

12. It must be strongly emphasized that students are not to try anything new or break any of the regulations.

13. If a safety rule is broken by a student, the tag which follows the name and machine is withdrawn from the chart or turned over to reveal a red surface. This red tag indicates a violation and forfeits the use of the machine a period of one day to one week. Further violations will draw more rigid reprimands.

14. Habitual violators, who have three or more violations, will forfeit the use of the machine for one semester, or for the remainder of the school term.

15. Make it definitely clear in the minds of the students that safety is all-important and applies very directly to the machines they will use. Emphasize that violations could very conceivably cause an accident and that the program is for student safety.

LATHE DRAW CHUCK

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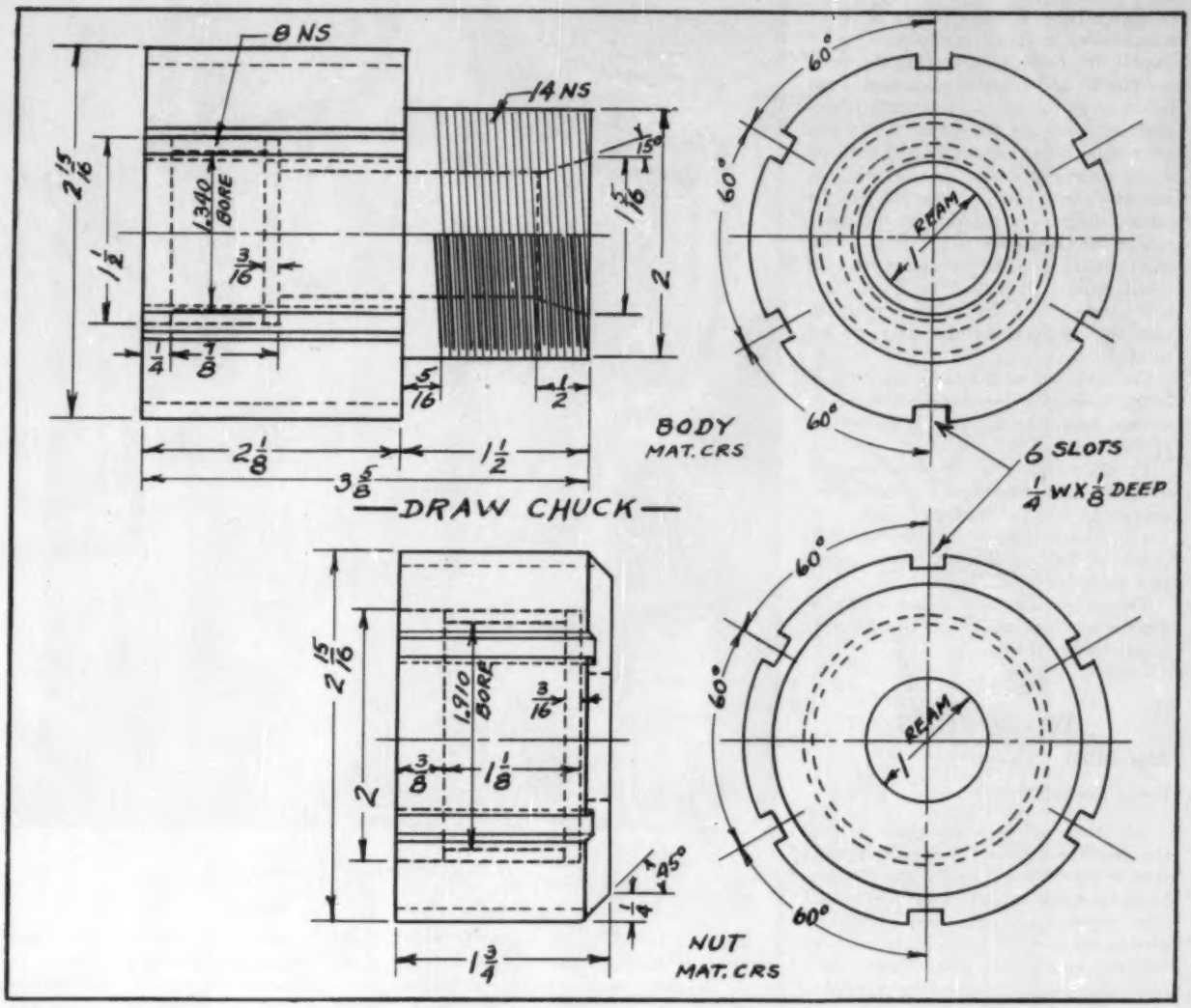
Olney High School
Philadelphia, Pa.

In the May, 1956, issue of this magazine there was shown a project, "Draw Chuck," designed to be used in a lathe having a No. 4 Morse tapered spindle hole. That, of course, would not be adaptable to smaller lathes, such as a bench lathe. Therefore, the author designed a draw chuck that would suit this purpose and still be in the economical class. Also, the split sleeves or collets designed for the previous model will fit this chuck interchangeably.

The draw chuck presented here is fitted



Detail drawing of the lathe draw chuck

to the threaded spindle nose of the smaller lathes. It is made of two pieces of 3-in. cold-rolled steel. The slots on the finished pieces allow for tightening and loosening the body on the spindle nose of the lathe and the nut adjustment with an adjustable hook spanner wrench. The author has found these economical chucks, made and used by the shop students, for the past twenty-five years, to give very satisfactory service. They have required no servicing during that time.

EXAM CARDS

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Industrial Arts Instructor
Cocalico Union High School
Denver, Pa.

Over a period of time the industrial-arts teacher invariably uses the same questions

EXAM CARD

Area.....Woodworking..... **No**.....

Type of Question

....True-False ....Multiple Choice ....Completion ....Essay

Question:

Please do not deface this card

in examinations. Whether it be a semester examination, a final examination or a *quickie*, the problem of keeping the questions on file and available when needed can be solved by the use of exam cards. These cards, as shown, are printed for the various areas of the industrial-arts shop by students in the graphic arts. The name of the area for which the card is intended can be printed directly on the card or the space can be left blank and later filled in as the questions are typed on the card. Each card is numbered as it is used for a particular area starting with No. 1 and continued until the questions for that area are exhausted.

The questions on the cards can be read to the students or the cards can be passed around; hence, the statement at the bottom of the cards.

To make correcting the tests easier, a small notebook is excellent for keeping the answers by area and number.

3 by 5 cards are cut from various colors of bristol. Using a different color for each area simplifies filing.

This system has been in use in our industrial arts department and I find it very satisfactory.

TOTEM POLES

BEN HUNT

Hales Corners, Wis.

The home of the totem poles is along the Northwest Coast of North America from as far north and west as the Aleutians to as far south as California. The Indians who carved these poles also excelled in carving many other things including very elaborate masks and rattles. Except for a few poles recently carved for exhibition purposes, totem poles are no longer produced. Most of the older poles were carved fifty to one hundred years ago and many of them have been neglected and have fallen into decay. The better ones have been acquired by museums and collectors, or they have been erected in private and municipal parks.

The purpose of this chapter is twofold. First of all, for those who may wish to whittle them for decorations, and second, for those who may wish to carve a large pole for a camp or other outdoor attraction. I noticed several totem poles along the shores of lakes in northern Wisconsin last summer while fishing and they present a striking appearance when erected against a background of tall evergreens.

Small decorative poles are whittled out of 2-in. white pine or basswood and are made like the large poles with the back flat as shown in Figure 1. Most of the large poles were flattened in back and some were even hollowed out in order to remove the weight for easier erection. In other words, the back of the pole is not carved.

Totem poles

As far as whittling or carving is concerned, the drawings are self-explanatory. Both of these were whittled with the small blade of a pocketknife. The wings, beaks, and dorsal fins are always added.

Small poles should be sandpapered nicely.

Large outdoor poles can be carved out of 12- to 15-in. cedar telephone or line poles or tree trunks of pine, cedar, or bass. Green wood carves easier than dry wood except, of course, when you run into an occasional knot.

Now for painting. Small, decorative poles are best colored with poster water colors and large outdoor poles are always painted with ordinary house paint.

At the top of Figure 1 is shown a color key and I have indicated the larger color areas in the drawings. The wings and other parts of the birds marked W + are decorated with black + blue stylized feathers, as shown in the half tones. Eyes for the most part are colored as shown at top of Figure 2, although sometimes the eyeball is red and the rims are white as was done in the animal figure at the base of the Thunderbird pole. The frog has yellow spots over green on the body and legs. You will also note lines in black and white, usually outlining a color area, as around some of the eyes. If you wish to make changes, go ahead, as long as you don't use purples or magentas or pastel shades of color.

The writer would rather carve two poles than paint one. Fig. 2 on page 26.

INSTRUCTIONAL UNITS IN HIGHWAY AND TOPOGRAPHICAL DRAFTING

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Drafting Instructor

Vocational and Adult Schools

La Crosse, Wis.

There has been an indication of an increased need for the training of engineering aids in highway construction; one of the reasons being the present and future construction of the federal interstate highway system. One of the institutions where this training is being conducted is in the Vocational and Adult Schools of Wisconsin. A program for the training of highway en-

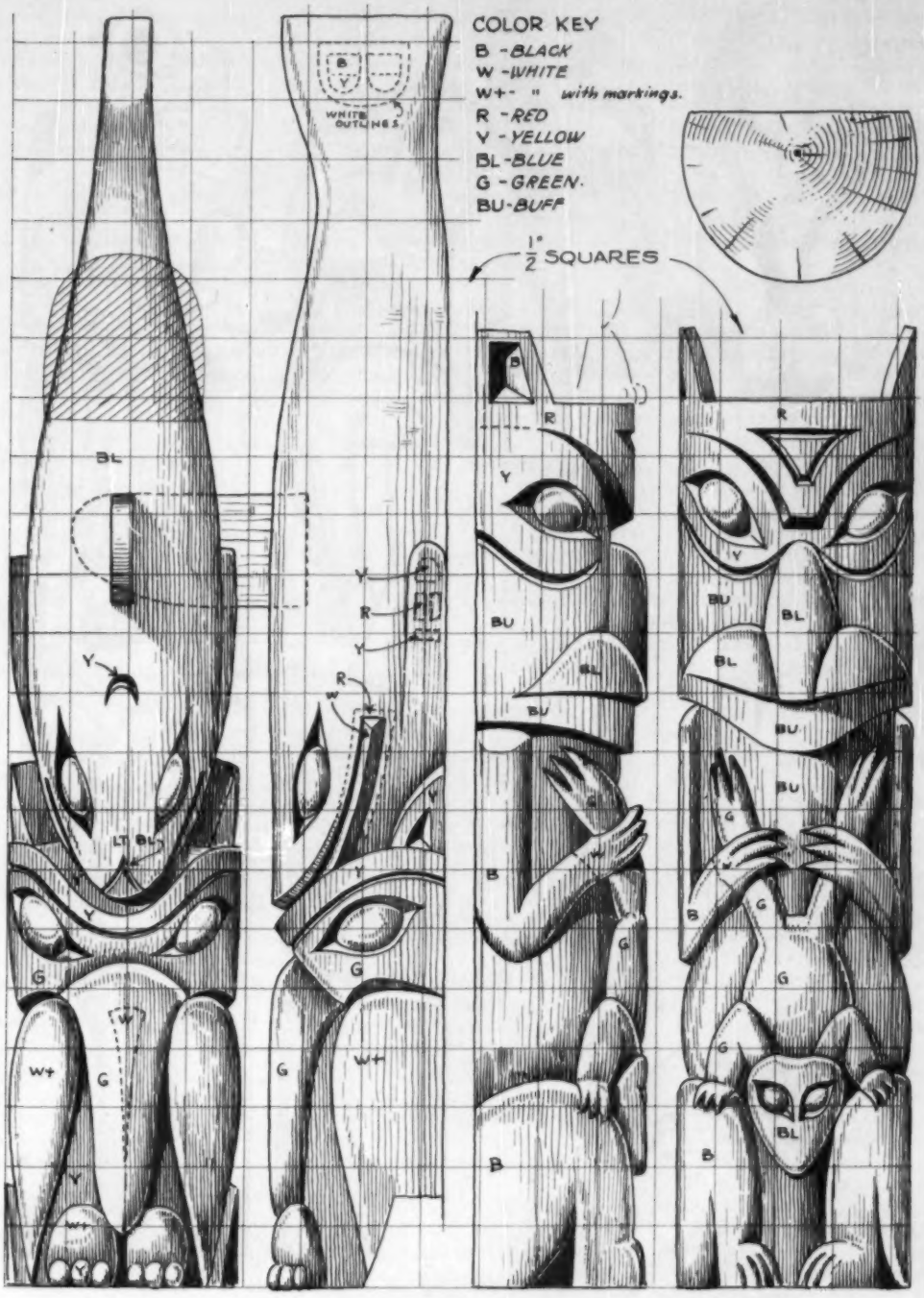

Fig. 1. Detail drawing of a totem pole

gineering aids was started at the Vocational and Adult Schools at La Crosse, Wis., during the school-year 1957–58.

One of the phases of this training is in the field of drafting. One of the problems involved in setting up a training program is in the identification of the instructional units. The following lists and outlines of instructional units are the results of a study of pertinent literature, consultation with highway engineers, and practical experience of the writer in a district office of the Wisconsin State Highway Commission. Some of the units listed do not directly involve drafting but can be taught in the drafting department to correlate with and assist in the solution of drafting problems.

Implementation of the instructional units may be had by use of the instruction sheet in syllabus form, by use of actual or reproduced survey notes, by use of actual highway plans, and by use of problems set up by the instructor. Most of the advanced drawings made by the student should be finished in ink on tracing cloth, including Federal Aid Sheets. A transit can be set up in the drafting room or any

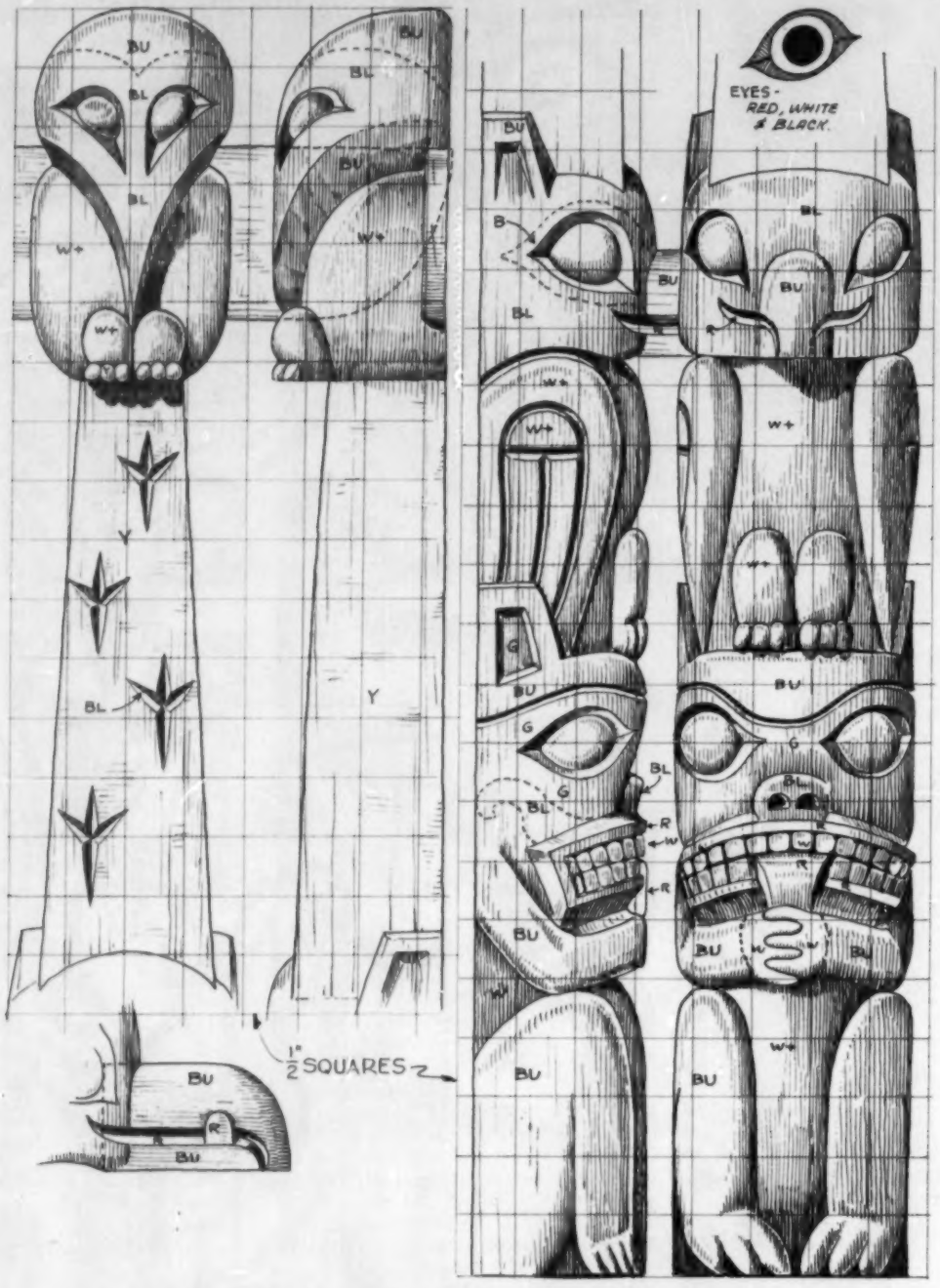

Fig. 2. Detail drawing of a totem pole

vacant room allowing the student practice in the care and use of the transit, turning and reading angles to points along the walls, reading the leveling rod, and determining H.I. and elevations of points.

General Drafting Units

These preparatory instructional units are not listed in detail, as they can be found in many drafting references. They should involve between two hundred and three hundred hours of drafting time depending upon the prior drafting experience and ability of the student. They should give the student a good background of essential, basic, and elementary principles involving the following:

1. Drafting techniques, use and care of instruments, alphabet of lines, lettering, geometric figures, and geometric constructions
2. Methods of projection
   - *a*) Isometric sketching, drawing, sections
   - *b*) Oblique sketching, drawing, sections
   - *c*) Perspective sketching, and instru-

ment one, two, and three point perspectives

d) Orthographic sketching, instrument drawing, reading, interpretation

e) Auxiliary views

3. Types and methods of sectioning, code of materials

4. Principles and rules of dimensioning, notes

5. Threaded and unthreaded fasteners, springs

6. Detail and working drawings

7. Basic elements of intersections, developments, pipe drawings, architectural and structural drawings, welding symbols, rendering of drawings, and reproduction of drawings

8. Others

Characteristic Drafting Units

Practically all of the following units involving drawing should be finished in ink on tracing cloth, including Federal Aid Sheets. They are not necessarily listed in proper sequence.

1. Read highway maps.
2. Read highway traffic flow maps.
3. Read topographic maps.
4. Read a map showing underground facilities.
5. Read right-of-way maps.
6. Read railroad property maps.
7. Read plat books.
8. Draw a map title block.
9. Read and draw conventional signs and symbols of man-made works and structures.
10. Read and draw conventional signs and symbols of survey stations.
11. Read and draw conventional signs and symbols of vegetation and land types.
12. Read and draw conventional signs and symbols of hydrography.
13. Read and draw township boundary or range line.
14. Read and draw a section line.
15. Read and draw a quarter section line.
16. Read and draw a sixteenth line.
17. Read and draw a property line.
18. Draw conventional arrow indicating magnetic north.
19. Draw conventional arrow indicating true north.
20. Read and draw graphical scales.
21. Letter various sizes with mechanical lettering device in pencil.
22. Letter various sizes with mechanical lettering device in ink.
23. Read and letter conventional abbreviations.
24. Letter a schedule of lands and interests required.
25. Letter a schedule of bars for a structure.
26. Lay out and letter an estimate of quantities sheet.
27. Lay out and letter a title sheet for set of highway plans.
28. Lay out and letter a list of bench marks on plan sheet.
29. Letter cubic yards of cut and fill on cross-section sheet.
30. Measure distance with civil engineers' scale.
31. Compute and plot distances with civil engineers' scale.
32. Measure an angle with a protractor.
33. Compute and plot a bearing angle from azimuth with protractor.
34. Compute and plot an azimuth from a bearing with protractor.
35. Compute and plot deflection angles with protractor.
36. Compute and plot azimuths from clockwise angles with protractor.
37. Compute and plot azimuths from survey notes.
38. Compute and plot azimuths by applying corrections to Polaris deviations using Ephemeris Tables.
39. Plot points by intersecting lines with protractor.
40. Compute and plot an angle by the tangent method.
41. Compute and plot an angle by the chord method.
42. Plot points by rectangular co-ordinates.
43. Plot points by polar co-ordinates.
44. Plot an open traverse by above methods.
45. Plot a closed traverse by above methods.
46. Balance and close a survey.
47. Draw a plan of a survey.
48. Draw plan, elevation, and section views of riprap at side road culverts.
49. Draw plan, elevation, and section views of riprap and sod at private entrance culverts.
50. Draw plan, elevation, and section views of mortar rubble masonry and sod ditch checks.
51. Draw plan, elevation, and section views of grouted rubble paved ditch.
52. Draw plan, elevation, and section views of earth dike.
53. Draw section view of type A concrete curb and gutter.
54. Draw section view of type B concrete curb.
55. Draw section view of type C concrete gutter.
56. Draw section view of type D concrete curb (rural).
57. Draw plan and section views of inlet or discharge curb and gutter surface drain.
58. Draw plan, elevation, and section views of reinforced concrete bridge.
59. Draw plan, elevation, and section views of bridge with timber substructure and abutment.
60. Draw plan, elevation, and section views of corrugated metal culvert pipe.
61. Draw a typical finished highway section.
62. Draw a finished highway superelevated section.
63. Draw a side road section.
64. Draw a private entrance section.
65. Plot a transit line from survey notes.
66. Plot existing topography from survey notes.
67. Plot a horizontal curve.
68. Determine size of horizontal curve by applying factors involved.
69. Draw proposed highway center line.
70. Plot locations of center lines of proposed side roads and private entrances on main center line.
71. Plot profile of ground from survey notes.
72. Plot vertical curve.
73. Determine vertical curve by applying factors involved.
74. Plot proposed grade of highway on profile sheet.
75. Plot cross sections from survey notes.
76. Show culverts on cross sections.
77. Draw cross sections of channel change where applicable.
78. Plot a mass diagram.
79. Draw plan of turn-off parking area.
80. Determine location and plot right-of-way marker posts.
81. Determine and indicate location of bench marks on plan sheet.
82. Draw side road intersection details.
83. Draw plan view of a directional interchange.
84. Draw plan view of a diamond interchange.
85. Draw plan view of a cloverleaf interchange.
86. Draw a sketch of parcel required for right-of-way.
87. Draw location sketch of highway project.
88. Draw a plan of right-of-way.
89. Draw complete set of highway plans from survey notes.
90. Draw a street intersection.
91. Draw a city block.
92. Draw a city subdivision.
93. Draw a real estate development area.
94. Draw contour lines.
95. Interpret contour interval.
96. Interpolate spacing of contour lines by estimation and plot.
97. Interpolate spacing of contour lines by computation and plot.
98. Interpolate spacing of contour lines graphically and plot.
99. Draw a contour map from checkerboard elevations.
100. Draw a contour map from control point elevations.
101. Draw plan view of given grade line on contour map.
102. Plot highway center line on contour map.
103. Draw profile of center line on contour map.
104. Plot cross sections from contour maps and plan books.
105. Compute earth quantities from cross sections from contour map.
106. Design a short stretch of highway by use of topographical maps.

107. Make a complete set of highway plans by use of topographical and contour maps and plan books.

108. Others.

Related Mathematics Units

These units are included because they can be taught in the drafting department.

A. Review of arithmetic: addition, subtraction, multiplication, and division of whole numbers, decimals, fractions, mixed numbers, per cent, areas, volumes, square root, changing one to the other, changing hundredths of feet to inches, changing inches to hundredths of feet, and others.

B. Algebra: symbols, exponents, positive and negative numbers, formulas, equations, monomials, polynomials, parenthesis, algebraic fractions, factoring, and others.

C. Geometry: plane, points, lines, angles, circles, triangles, rectangles, parallelograms, trapezoids, solids, geometric elements of construction, others.

D. Slide rule: multiplication, division, square and square root, cube and cube root, others.

E. Trigonometry.

1. Compute sides of right triangle with natural functions.
2. Compute sides of right triangle with logarithms.
3. Compute angles of right triangle with natural functions.
4. Compute angles of right triangle with logarithms.
5. Compute sides of oblique triangles with natural functions.
6. Compute sides of oblique triangles with logarithms.
7. Compute angles of oblique triangles with natural functions.
8. Compute angles of oblique triangles with logarithms.
9. Compute rectangular co-ordinates with natural functions.
10. Compute rectangular co-ordinates with logarithms.
11. Compute area of right triangles.
12. Compute area of oblique triangles with natural functions.
13. Compute area of oblique triangles with logarithms.
14. Compute areas of trapezoids.
15. Compute areas of parallelograms.
16. Compute areas of land by resolving into geometric figures.
17. Compute acreage of right-of-way required mathematically.
18. Compute area from rectangular co-ordinates.
19. Solve problems using Talbot's Formula.
20. Compute line of direction from rectangular co-ordinates.
21. Compute horizontal highway curves.
22. Compute vertical highway curves.

Characteristic Miscellaneous Units

These units can be correlated with the solution of highway drafting problems.

1. Read and use a planimeter.
2. Compute acreage of right-of-way parcels with planimeter.
3. Compute acreage of right-of-way parcels by "buggying" method.
4. Determine drainage area by use of planimeter.
5. Determine size of culvert by use of Talbot's Formula.
6. Determine end area of cross sections with planimeter.
7. Determine area of cross section by "buggying" method.
8. Compute earth and rock quantities from cross sections.
9. Determine cubic yardage of excavation for box culverts.
10. Determine cubic yardage of concrete needed for box culvert.
11. Interpret equation where transit line crosses center line.
12. Compute length of center line of highway in feet and miles.
13. Check property descriptions and ownership.
14. Check legal description of right-of-way parcels against the parcel on the plan being described.
15. Write a legal description for right-of-way parcel of land required.
16. Ascertain bench marks for a plan from survey notes.
17. Ascertain and plot on plan sheet tie-in points from survey notes.
18. Compute H.I. and reduce survey notes.
19. Determine amount of new grass seeding from cross sections.
20. Check location of right-of-way lines.
21. Erase inked lines from tracing cloth with electric erasing machine.
22. Proofread typed material against rough copies.
23. Operate an adding machine.
24. Operate a computing machine.
25. Set up, operate, and adjust surveyor's transit.
26. Turn and read horizontal and vertical angles with transit.
27. Read and give surveyor's hand signals.
28. Determine H.I. and elevations of points with leveling rod.
29. Tape distances with "chain."
30. Use range poles correctly.

The selection of instructional units for a training program in a particular situation depends upon many factors. Many improvements could be made on the foregoing lists. Although there are other phases involved in the training of engineering aids, such as surveying, materials testing, principles of highway design, etc., it is hoped that this article will be of some assistance in the program of training highway engineering aids. A broad and thorough background will assist the individual in adapting to on-the-job situations.

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12. *A Policy on Geometric Design of Rural Highways* by American Association of State Highway Officials, Washington, D. C.
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15. Pamphlets, Booklets, and Specifications from State Highway Commission
16. Others

You can help prevent aching backs from lifting by observing these tips: Bend your knees and squat close to the load, rather than stooping with the legs straight. Keep your back as erect as possible. Get a good grip on the object you're lifting, and lift by straightening your legs steadily. — *National Safety Council.*

Gavels made of pieces of wood from each state were presented to the U. S. Senate and House of Representatives by a retired wood worker. They were polished on a lathe with shellac and linseed oil, an old finishing method. Today thin, fresh coats of pure, white shellac applied by brush are used. — *Shellac Information Bureau.*

The Pentagon costs $63 million for the building, $7 million for the land and its approaches, and another $13 million on the highway system for the building. Based on the cost of similar office space in Washington, the Pentagon has just about paid for itself in 14 years. — *Wisconsin Military District Information Office.*

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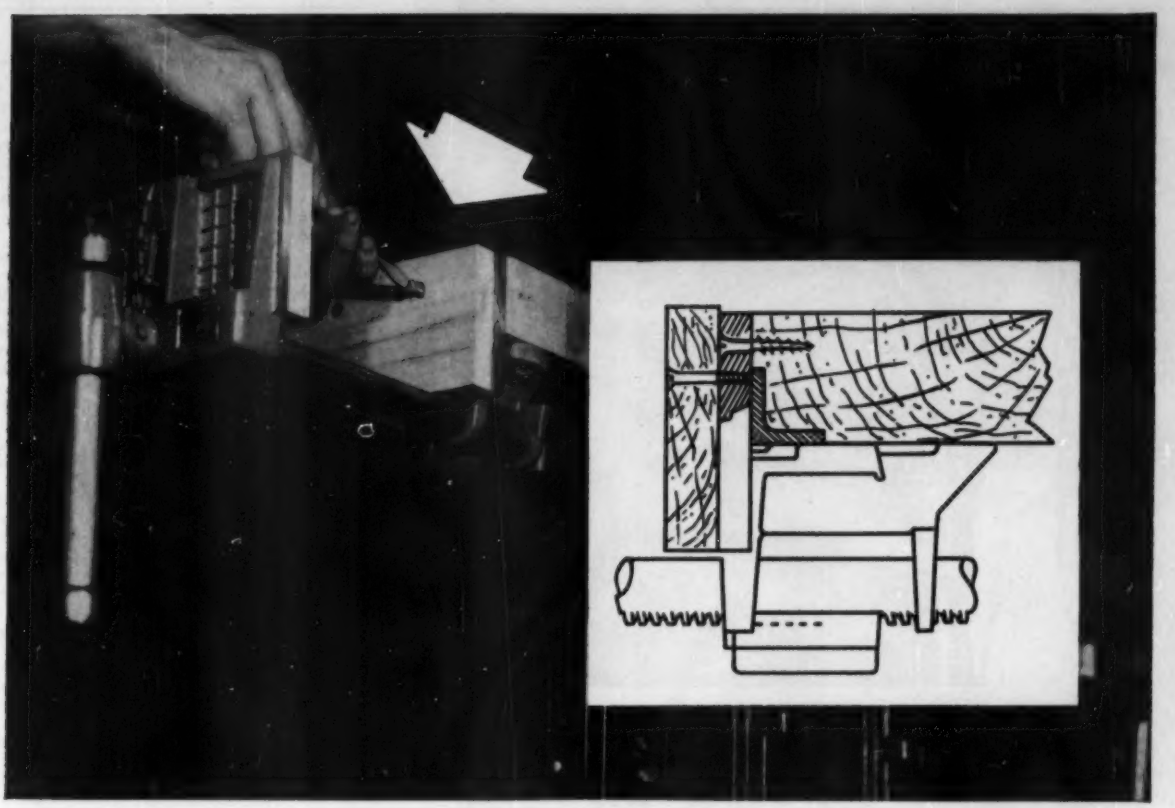
— *Shellac Information Bureau.*



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ASSOCIATION NEWS

(Continued from page 10A)

sons attending were the educational exhibits and live demonstrations given by students from industrial arts and vocational industrial shops across the state.

The ladies in attendance were welcomed by a planned program in their behalf that included a fashion show and a guided tour to a local decorating gallery.

A phase of the conference that everyone could enjoy equally was the commercial exhibits occupying 38 booths and representing almost every conceivable item that might be used in industrial and distributive education.

The K.I.E.A. banquet began at noon on Saturday. The featured speakers were Dr. Robert R. Martin, State Superintendent of Public Instruction, and Sam Ezelle, Executive Secretary-Treasurer, Kentucky State A.F.L.-C.I.O. Their respective topics were "An Overview of Education in Kentucky" and "Labor Looks at Industrial Education."

After the banquet, honorary memberships were presented to persons who have made outstanding contributions to the field of industrial education. The recipients and their former positions were L. T. Smith, Chairman, Department of Industrial Arts, Western Kentucky State College; Harold G. Wilson. Director, Industrial and Distributive Education, Kentucky State Department of Education; Dr. Charles R. Crumpton, Teacher-Trainer, University of Louisville, and C. Nelson Grote, Assistant Director, Industrial Education, Kentucky State Department of Education.

Newly elected officers for the coming year are L. C. McDowell, president; J. M. Moore, vice-president of Industrial Arts; Harold Rice, vice-president of Trade and Industrial Education; Phillip C. Hampton and Dale Patrick, directors.

The "Ship's Program" closed the conference with a drawing of prizes contributed by the commercial exhibitors.

Personal News

J. A. PATLOW DIES

John A. Patlow, 62, vice-principal of the Milwaukee Vocational School, and chairman of its evening technical engineering department, died on November 7, at Milwaukee, Wis. He had been on the Vocational School faculty for 33 years, and became vice-principal in charge of faculty services in 1940. In 1938, in collaboration with Fire Chief Edward Wischer (then head of the Fire Department's fire fighting school), he developed an instructor training course for fire captains and lieutenants.

He directed a pilot survey, sponsored by the Industrial Training Conference of Milwaukee, which served as a guide in establishing the Institute of Technology at the Vocational School in 1951.

Mr. Patlow was born in Ely, Minn., and after finishing high school, attended Stout Institute in Menomonie, Wis., where he received a bachelor's degree from the institute in 1924. In 1930 he received a master's degree from the University of Nebraska.

He did some of his early teaching in Bayfield, Wis., and Aberdeen, S. Dak., and was later director of industrial arts and vocational education at Lincoln, Neb., and Pontiac, Mich.

He was a past president of the Milwaukee School Masters' Club and the Parent-Teacher Association of the Roosevelt School, Wauwatosa, and a former secretary of the Wisconsin

(Continued on page 16A)

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William A. Kavanaugh,
B.S., M.S., PhD

Assistant Professor of Electricity—Radio Electronics, University of Minnesota

Dr. Kavanaugh's education in the field of Electricity, Radar, Electronics and related sciences has spanned nearly a quarter of a century. He has been a distinguished teacher of high school, college and adult classes for fourteen years. His contributions to the teaching profession have long been admired, and his abilities have earned him nationwide prominence in the Industrial Arts field.

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PERSONAL NEWS

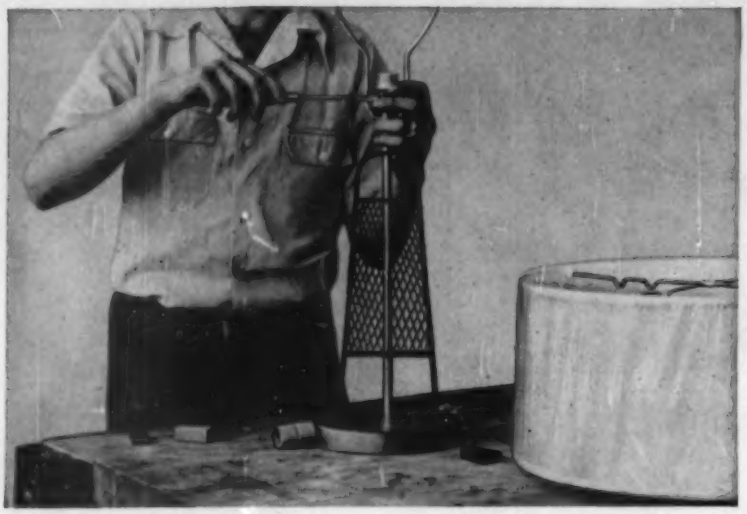
(Continued from page 14A)

Vocational Guidance Association. He belonged to Phi Delta Kappa, the Engineers' Society of Milwaukee, the Industrial Relations Association of Wisconsin, the Wisconsin Association for Vocational and Adult Education, the American Vocational Association, and the Wisconsin and National Education Associations.

Mr. Patlow is survived by his widow and two daughters; also four sisters and a brother.

This lamp-making project

teaches two lessons



How to make a lamp is just one of the things students learn from this project. . . . Another is how to make a lamp that is also an *efficient lighting instrument*. Such a lamp must be designed with the user and the use in mind, so that it provides sufficient, glare-free light, properly distributed, for the user's needs.

For instance, to make a *table* lamp that does an effective lighting job, you will find this simple equation valuable:

From the average eye-level height of a seated person (40"), subtract the average end table's height (24"). The difference — 15" — is about what this lamp should measure from the table to shade bottom.

This and other valuable lamp-making facts are part of the program, "Working with Light." This program —which helps you teach "the facts of light" — was prepared by the Better Light Better Sight Bureau after consultation with representatives of the National Education Association and others prominent in the field of industrial arts and vocational education. Specially designed for high school and junior high school industrial arts classes, this program includes a 116-page Lighting Handbook, 12 Project Leaflets and a student Reference Folder.

FREE AIDS. A complete package of "Working with Light" materials will be sent to shop teachers *without charge* in areas where there is a Better Light Better Sight Bureau sponsor. (We will check our sponsor list for your area.) To get your materials, fill in and mail the coupon *today*.

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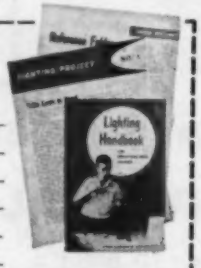

DR. RAYMOND VAN TASSEL

Dr. Raymond Van Tassel was appointed acting chairman of the Department of Vocational Education, New York University, to replace Dr. Robert L. Thompson, who died on October 17, 1958, after a heart attack.

His appointment took place on October 31. He is a graduate of Oswego Teachers College, having received his B.S., M.A., and Ed.D. degrees from New York University. He has been a member of the staff at New York University for 22 years.

DR. RALPH K. NAIR ACCEPTS APPOINTMENT

Dr. Ralph K. Nair, associate professor of industrial arts at University of California, Santa Barbara, Calif., has accepted an appointment as assistant director of Relations With Schools for the state-wide University of California. The appointment was effective July 1, 1958.

Dr. Nair is continuing his teaching in the department of industrial arts, as well as representing the Office of Relations With Schools.

He is a graduate of Kansas State Teachers College, and received his doctorate from the University of Missouri in 1950. He has been teaching at Santa Barbara since 1941.

WINNER OF TWO SCHOLARSHIP AWARDS

Dennis C. Swindall, a freshman majoring in industrial arts at the University of California, Santa Barbara, has been named winner of two scholarship awards. Dr. Kermit A. Seefeld, chairman of the Industrial Arts Department, presented the awards to Mr. Swindall following his registration.

He received the 1957–58 California Industrial Education Assocation (Southern Section) Future Teacher Scholarship Award for $200. He also received one of two $250 national scholarships from the American Vocational Association's industrial arts division.

Scholarships provided by CIEA and AVA are awarded to outstanding high school graduates who are seeking a career in the industrial arts teaching field.

U. S. AIDE DIES

Donald H. Dabelstein, assistant director for the Program of the Federal Office of Vocational Rehabilitation for more than eleven years, died recently of a heart attack following pneumonia.

Mr. Dabelstein was internationally known in the rehabilitation field. He had received the Superior Service Award of the Department of Health, Education and Welfare for his work in establishing research projects and rehabilitation programs in the fields of chronic illness, industrial accidents, and congenital disability.

He was born in Winona, Minn. He received a bachelor's degree from the University of Minnesota in 1928 and a master's there in 1933.

HAROLD J. VAN WESTRIENEN DIES

Harold J. Van Westrienen, East Lansing, Mich., assistant superintendent of public instruction, and state director of vocational education, died in June, 1958. He had been ill and was at home.

Mr. Van Westrienen was a native of Grand Haven. He was graduated from the University of Michigan and had taught school in the Detroit area, and from 1938 to 1941 he was chairman of the Royal Oak Recreation Commission. He was also a member for ten years and president for three years of the Royal Oak board of education.

Mr. Van Westrienen was elected first president of the Michigan Industrial Education Society in 1928 and held a number of prominent positions on national education

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committees. In 1951 he was listed in *Who's Who in American Education*.

He served during World War I, had written articles for educational magazines, and on July 1, 1953, became state director of vocational education.

Surviving are his widow, Beth; a daughter, Mrs. Earl Gaskill of Miami, Fla., and two brothers, Charles and Henry, both of Kalamazoo.

EDUCATIONAL RESEARCH DIRECTOR NAMED

Ronald D. Clark was recently named educational research director of International Correspondence Schools, Scranton, Pa.

A native of New Milford, Pa., Mr. Clark is a graduate of Harford Vocational High School, Harford, Pa., and Pennsylvania State University where he received his B.S. degree. An alumnus of Lehigh University, where he did graduate work in educational guidance, he received his M.S. degree in education from the University of Scranton.

Prior to joining ICS as an educational research training analyst in 1954, Mr. Clark taught high school at Oley and Revere, Pa. From 1949 to 1954, he was associated with the Veterans Institutional On-Farm Training Program in Bucks County in curriculum studies.

Mr. Clark is a World War II veteran, having served in the U. S. Navy in the Pacific Theater of Operations. He is a member of Delta Theta Sigma; the National Education Association; Pennsylvania State Education Association; and the American Educational Research Association.

NEW VOCATIONAL DIRECTOR APPOINTED

Dr. Bernard Francis Rappaport has been appointed director of industrial arts and vocational education for the Levittown Public Schools, Levittown, N. Y. His function will be to develop, co-ordinate, and improve the programs in these areas. He was formerly a department chairman in the New York City school system and will continue to serve as an instructor in education at New York University.

Dr. Rappaport has also been active in the field of crafts as part of a total program of recreation. He not only conducted institutes and clinics in the training of teachers and crafts counselors, but was also in charge of a community recreation program.

In addition to his many years of teaching and administrative experience, Dr. Rappaport has had much industrial experience as a consultant and designer for Bell Telephone Laboratories, Sperry Gyroscope Company, General Electric Company, and other smaller concerns.

♦ G. Kent Stewart, formerly instructor of industrial arts at Westville Township High School, Westville, Ill., is now at Eastwood Junior High School, Indianapolis, Ind.

♦ L. S. Wright, up to now assistant professor in the industrial-arts department at Iowa State Teachers College, Cedar Falls, Iowa, has been advanced to associate professor.

♦ Frank Mallozzi is now with the Alfred I. duPont School District, Springer Junior High School at Wilmington, Del. He had been associated with the Chichester Joint Schools at Boothwyn, Pa.

♦ A 1937 graduate of Stout State College, Manvell A. Olson, is teaching mechanical drawing at Roosevelt High School in Atlanta, Ga.

♦ R. H. Carrington is the director of vocational education in the River Rouge schools.

A CLAUSING VERTICAL MILLER will be the most valuable machine in your shop!

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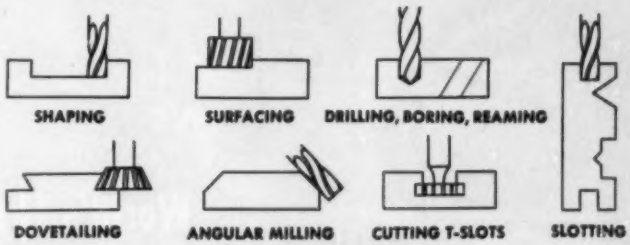
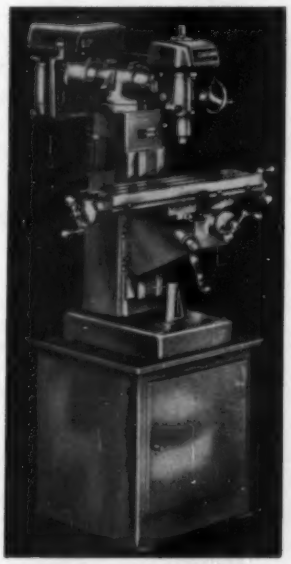


Best of all, they can do *all* these operations with *one* work set-up! The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane, making it possible to mill, drill, bore, ream and shape at all angles without a single change in work setting.

The Clausing — a machine tool widely used throughout industry — is built to rigid standards for efficient operation, sustained accuracy, and long service. For example, there are 7 ball bearings in the head and drive — feed screws have ground threads, turn on ball bearings — bearing surfaces of table, saddle and knee have gibs for lasting accuracy. It has the endurance you want and need.



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Cross Table Travel	5"
Vertical Table Travel	11 ⅝"
Max. Distance Spindle to Column	8¾"
Spindle Travel	3"

Spindle Speeds: Six, 180 to 3250 RPM. No. 7 Brown and Sharpe or No. 2 Morse Taper Spindle optional. Operates from ½ to ¾ HP, 1725 RPM motor.

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News Notes

TWO-DAY INDUSTRIAL TOOL SHOP

Benson Polytechnic School, Portland, Ore., in co-operation with Portland industries, conducted a two-day Industrial Tool Shop on December 12 and 13, 1958. The purpose of the show was to promote the use of safer and better tools, and it is hoped that Benson Polytechnic School will become established as the site of a biannual show of this type.

Factories or their distributors in the following fields were invited to participate: machinery — metalworking, woodworking, sheet metal, electronics, automotive test equipment, abrasives; hand tools — wood, precision, mechanics, sheet metal, automotive, micro-precision inspection equipment; also cutting tools, including carbides, safety equipment, welding (all phases), and portable electric tools.

All industrial-arts instructors in Oregon, Washington, and Idaho were made welcome, as well as all industrial firms in Oregon and journeymen and apprentices belonging to unions involved.

The show was specifically pointed toward the industrial arts instructors and the man in industry. An effort is being made to identify Benson Polytechnic School with industry to the extent that the Industrial Tool Show is a Pacific Northwest community endeavor. — *Al J. Riendeau, activities director.*

TRAINING DIRECTORS CONFERENCE

A Training Directors Conference, held on the Cornell University Campus on October 21–23 by the New York State School of Industrial and Labor Relations, commemorated the tenth anniversary of the founding of the Industrial Training Council. The conference theme was "Impact of Technological Change on Training and Development." The program was held in co-operation with the Industrial Training Council of New York State.

A feature of the program included concurrent workshops on "What's Ahead in Industrial Training and Development." Each Workshop was repeated so that each participant could enroll in two of the four workshops. Workshop leaders included ILR Professors Ralph Campbell, F. F. Foltman, and Robert Risley.

ACCREDITED HOME STUDY SCHOOLS

Thirty-seven schools are on the 1958 *List of Accredited Home Study Schools* just released by the National Home Study Council in Washington, D. C.

Dr. Homer Kempfer, executive secretary of the Council's Accrediting Commission, states that these 37 accredited schools meet the highest standards in the nation. They enroll 60 per cent of all private-home-study students.

Two schools are on the *List* for the first time: National Camera Repair School at Englewood, Colo., and The Hadley School for the Blind, Winnetka, Ill.

The National Home Study Council has been the standard-setting agency for private correspondence schools for 32 years. It inspects home-study schools to see if they maintain high educational and ethical standards. All schools on the *List* have undergone a thorough examination within the past three years.

A copy of the *List* may be obtained by writing to the *National Home Study Council, 1420 New York Ave., N.W., Washington 5, D. C.*

THREE NEW SCIENCE FILMS

The Audio-Visual Center, Indiana University, has released three new science films in biology, in step with current plans for strengthening the training of scientists in the United States.

Stressing the significant roles played by microorganisms in the biological world, the films show how man studies, uses, and controls bacteria.

Bacteria: Laboratory Study shows characteristics of microorganisms and proper methods for studying them.

Microorganisms: Beneficial Activities points out many common uses of bacteria in everyday life and indicates that most microorganisms are beneficial to man.

Microorganisms: Harmful Activities explains how microorganisms cause diseases and how they can be controlled.

Each film: 15 minutes, sound, color or black and white.

Agencies interested in considering any of the films in this series may obtain preview prints from the *Audio-Visual Center, Indiana University, Bloomington, Ind.*, at no cost other than return postage. Prints of these films can be purchased, and are available also on an annual rental plan which leads to ownership.

♦ New instructional materials and projects in the field of ceramics were developed in a special technical summer course in advanced ceramics, conducted at State University Teachers College, Oswego, N. Y., during the past summer.

Taught by Thomas O. Gangi, teacher of Industrial Arts Ceramics at Halsey Junior High School, Rego Park, Queens, the course was conducted in conjunction with a special

(Continued on page 20A)

NOW IT'S A DRIVER!

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B-G's LUMBER CONTEST

Brodhead-Garrett sure has a supermarket selection.

Which Lumber is Used Most in Schools in the order of Popularity?

1st Prize, $300 **2nd Prize, $200** **3rd Prize, $100**

Here is a jumbled list of the 20 most popular kinds of school shop lumber sold by Brodhead-Garrett. Study them carefully —then list them in what you estimate to be the order of their popularity on the attached coupon:

BASSWOOD	HARD MAPLE	RED OAK
YELLOW POPLAR	LIMBA	RED GUM
CHERRY	ANTIQUE WHITE PINE	ASH
PHILIPPINE MAHOGANY	GENUINE MAHOGANY	CYPRESS
AROMATIC RED CEDAR	AMERICAN BLACK WALNUT	SUGAR PINE
BLACK WILLOW	WHITE OAK	NO. 1 SHOP SUGAR PINE
BIRCH		BALSA

Brodhead-Garrett's 1957 school lumber sales records will be used as the master list of popularity in judging. Three closest contestants to that list will be awarded the above prizes. In case of ties for any prizes, postmarks will determine winner. Contest closes Feb. 1st. Winners announced in our ads at a later date.

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Lumber, Industrial Arts, Vocational Education Machinery and Equipment

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BRODHEAD-GARRETT CO., Dept. IA
4560 East 71st St., Cleveland 5, Ohio

My estimate of the 20 woods used most in school shops in the order of their popularity is as follows:

1_____	8_____	15_____
2_____	9_____	16_____
3_____	10_____	17_____
4_____	11_____	18_____
5_____	12_____	19_____
6_____	13_____	20_____
7_____	14_____	

My name_____

Title and Subject taught_____

School_____

Address_____

City_____ State_____

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NEWS NOTES

(Continued from page 18A)

curriculum construction workshop under the direction of Dr. James R. Hastings, professor of industrial arts at Oswego, with the auspices of the Bureau of Industrial Arts, State Education Department.

The materials and projects developed are to be incorporated into a manuscript of ceramics projects for industrial-arts teachers throughout New York State.

♦ A new home study course in Architectural Drafting is now being offered by the Extension Division of Cleveland Engineering Institute, Cleveland 3, Ohio.

For literature giving a complete outline and description of this modern course in Architectural Drafting write to: *Registrar, Cleveland Engineering Institute, 6300 Euclid Ave., Cleveland 3, Ohio.*

Of interest both to people seeking a gratifying career and those wishing architectural knowledge for their own personal use, the C.E.I. course has many advanced and unique features.

The course was written by Professor Watkins of The Ohio State University and architects and engineers of the Cleveland Engineering Institute faculty.

Students enrolling in the new C.E.I. drafting course receive a complete complement of textbooks, drawing materials, and professional instruments. The fees for the course cover all expenses, including supplies and materials.

♦ The Audio-Visual Center, Indiana University, Bloomington, Ind., have made available on a rental basis two new National Educational Television specials on 16mm. film.

"The Challenge to American Education" is discussed by leading educators who are members of the Educational Policies Commission in two 60-minute films. Programs A and B, black and white, each 60 minutes, rental rate $8.

"The Count Down" is a study of world disarmament. It is narrated by Peter Ustinov, a distinguished actor and playwright. The program is on 16mm. film, black and white, with sound, rental rate $4.75.

These films can be projected on standard 16mm. projectors. Address all rental orders to *NET Film Service, Audio-Visual Center, Indiana University, Bloomington, Ind.*

♦ The building of a full-sized utility house in an indoor shop has provided those enrolled in advanced general woodworking at State University Teachers College, Oswego, N. Y., the opportunity to apply woodworking theory on a life-sized object this past summer.

William D. Todd, associate professor of woodworking at Oswego, said that work on a utilitarian, life-sized project gives the student experience in actual carpentry operations, rather than in model building.

The workshop, under the supervision of Robert Bielefeld, a State Education Department member of the Summer Session staff, offered experimentation in the fields of carpentry, concrete form work, boat building, and constructing recreation equipment.

The utility house is of "prefab" construction and can be dismantled and removed from the woodworking shop in which it was built. It can be used for a cottage, tool storage, concession stand, ticket booth, or small workshop. Its floor plan is about 6½ by 8 ft., and it stands 9 ft. high.

Mr. Todd explained that the advanced general woodworking course is one in which project information and other valuable workshop ideas will be gathered and edited for use in a monograph to be printed later.

Copies of the monograph will be circulated to industrial arts and industrial-vocational instructors throughout New York State. They will be used as the basis for projects to be undertaken in school shops.

Four technicians are helping compile the material and write the monograph information.

Henry Knox was the first Secretary of War appointed by Congress, in 1785. — *Wisconsin Military District Information Office.*

Get your prize-winning FORD iaa student-project started now... send for 1959 information packet and rules book today!

Both student and teacher can win national recognition for industrial arts achievement through Ford's 13th annual Industrial Arts Awards Program.

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New Publications

Manufacturing Processes — Production

By S. E. Rusinoff. Cloth, 560 pp., 5¾ by 8½ in., illus. American Technical Society, Chicago, Ill.

A very instructive book of great use to the journeyman machinist, apprentice, and vocational student.

The book describes the metal processing in the machine shop; lathe operations and thread cutting; lathes and screw machines; milling machines; drilling, boring, and reaming machines; shapers, slotters, and planers; metal sawing and metal-filing machines; broaching machines and operations; gears and gearing manufacturing; grinding and finishing machines; inspection and quantity control; new methods in metal cutting; and new methods in chipless production.

(Continued on page 22A)

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Machining of Metal #33	3.60
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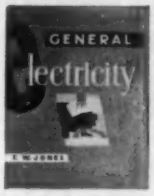

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NEW PUBLICATIONS

(Continued from page 20A)

Tender Warriors

By Dorothy Sterling and Don Gross. Paper cover, 96 pp., 5⅛ by 7¾ in., illus., $1.50; cloth, $2.50. Hill & Wang, Inc., New York, N. Y.

A book on segregation, and the trouble segregation has caused.

The Air

By Edgar B. Schieldrop. Cloth, 256 pp., 6¼ by 9¼ in., illus., $12. The Philosophical Library, Inc., New York, N. Y.

This book gives a very interesting account of man's attempts to fly from the earliest times to the present where the principles of heavier-than-air machines have been fairly well mastered.

The five chapters of the book treat the subject under the following titles: The Conquest of the Air, Man Flies His Machine, The Highways of the Air, A Host of Aircraft in the Sky, and Towards the Ultimate Limit.

Basics of Digital Computers

By John S. Murphy. Soft cover, three individual volumes, 416 pp., 6 by 9 in., illus., $2.50 per volume; 3-volume set $6.95; all 3 volumes in single cloth binding $7.95. John F. Rider Publisher, Inc., New York, N. Y.

This latest three-volume "picture-Book" course makes it easy for anyone with knowledge of the fundamentals of electronics to understand and master the basics of electronic digital computers.

Volume One reviews the development of computers, then thoroughly explains the basic theory of computer arithmetic, date representation, the program, and/or circuitry, and control.

Volume Two imaginatively and clearly discusses the logical elements, circuits, typical types of signals, and magnetic cores, which are then combined to show a few units such as encoders, decoders, counters, and adders that are typical of computers.

Volume Three handles the large system aspects of computers with separate discussions of types of memory, control system, and input-output equipment. Timing is also given extended treatment.

This "picture-book" course provides a broad background in computer theory, enabling you to learn the details of any specific computing system much more easily.

Building a Ship in a Bottle

By Raymond H. Biggs. Paper cover, 64 pp., 5½ by 8½ in., illus., $1.00. The Bruce Publishing Company, 400 North Broadway, Milwaukee 1, Wis.

This interesting book explains step-by-step just how to go about the job of getting the ship into the bottle which looks too small and a neck that is too narrow.

The job can be done, however, and the author tells the reader in an interesting and convincing manner.

Nuclear Energy

By Alexander Efron. Paper, 72 pp., 5½ by 8½ in., illus., $1.25. John F. Rider Publisher, Inc., New York, N. Y.

This is a compact study of a subject that interests laymen, students, and technical people alike. In clear, concise language, the atom; its make-up and uses are completely explained. The general historical background; the electron; the proton, the neutron, natural radioactivity, alpha beta and gamma rays, detectors, and isotopes among other topics are covered in the early portions of the book. Later discussion centers on more advanced concepts such as the mass-energy relationship, accelerators, induced radio-activity, uses of radioactive isotopes, nuclear fission, research and power reactors, and the hydrogen bomb. Illustrations and questions and problems at ends of chapters contribute to making the text easy to understand.

D-C Circuit Analysis

By Alexander Schure. Paper, 80 pp., 5½ by 8½ in., illus., $1.35. John F. Rider Publisher, Inc., New York, N. Y.

This text, part of the Electronics Technology Series, covers one of the most fundamental aspects of electricity. Beginning with a brief coverage of electrostatic principles and a chapter on resistance factors, it introduces the reader to the solution of circuit problems using Ohm's & Kirchhoff's Laws. The more advanced techniques employing superposition and Thevenin's theorum are introduced in later chapters. Throughout the text worked examples show how circuits of increasing complexity are solved. Review questions are included at the end of each chapter to test the reader's knowledge of the material.

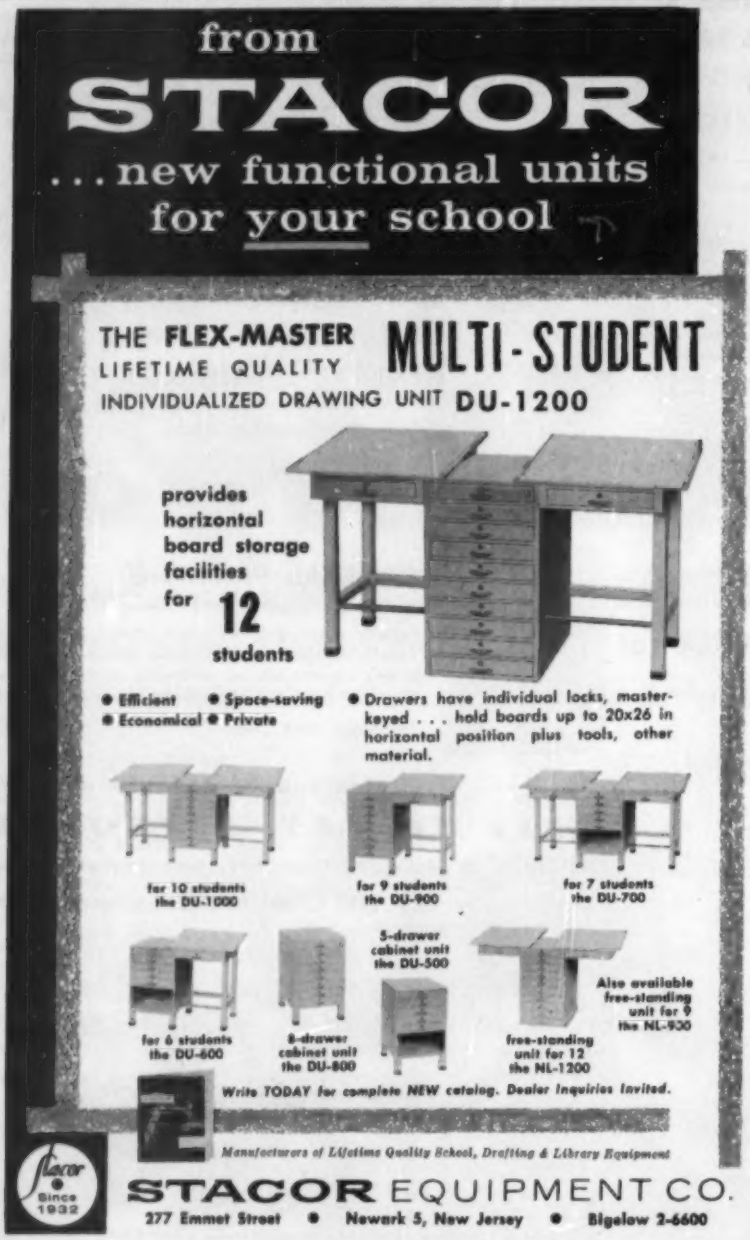
Nuclear Reactors for Power Generation

Edited by E. Openshaw Taylor. Cloth, 144 pp., 5⅝ by 8¼ in., illus., $7.50. Philosophical Library, Inc., New York, N. Y.

This book will give the reader an up-to-date insight in what nuclear-power-generation means.

The seven chapters discuss nuclear physics, types of reactors, materials, the physical basis of reaction design, safety and instrumentation, and application and economics.

(Continued on page 24A)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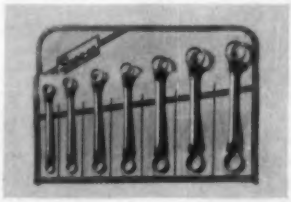

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NEW PUBLICATIONS

(Continued from page 22A)

Free and Inexpensive Learning Materials

Paper cover, 256 pp., 5 7/16 by 8 7/16 in., $1.50. Division of Surveys and Field Services, George Peabody College for Teachers, Nashville 4, Tenn.

This is the ninth edition of this useful book for those who are looking for materials that help the teacher do a better job.

Junior High School Handbook — Mechanical Drawing, Sketching, Blueprint Reading

Spiral binding, 73 pp., 6 1/2 by 9 in., illus. Printed in the Vocational High School Print Shop, Minneapolis, Minn.

This book for the beginner consists of five pages of explanatory matter, 14 plates of finished line drawings which show the student how mechanical sketching is to be done, 38 plates of mechanical drawing problems, together with some supplementary drawings on sheet-metal layouts, a floor plan, a topographic drawing, and an electrical schematic.

The section on blueprint reading consists of 12 pages which contain blueprint information, standard drawing symbols, ruler-reading exercises, and blueprint reading problems.

Education of the Aging

By Mrs. Betty A. Ward, U. S. Department of Health, Education, and Welfare. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., 60 cents.

Suggestions on how older men and women may be helped to meet the problems of increasing age intelligently and to good purpose are listed in a selected annotated bibliography.

This is a compilation of material gathered in a one-year study. It lists the most valuable references obtainable from materials provided by federal agencies, commissions set up to deal with the problems of aging, librarians, public school adult educators, university representatives, and private scholars.

Creative Design for the Industrial Arts Teacher

Prepared by Design Research Team, Department of Industrial Education, University of Minnesota.

Co-ordinated by Dezso D. Sekely. Published by Ford Motor Company Educational Affairs Department, Dearborn, Mich.

This book is an attempt to give the industrial-arts teacher an avenue of improving the design of his own projects by studying and analyzing the annual results of the Ford Annual Awards.

As noted in the foreword of this book by Harold J. Brennan, ". . . design takes meaning from an imaginative exploitation of material and process that are joined in an object that works well and pleases the eye."

Occupational Literature

By Gertrude Forrester. Cloth, 603 pp., 6 1/2 by 9 1/4 in., $6.50. H. W. Wilson Company, New York, N. Y.

This fine reference tool which first came on the market in 1946 now appears in a 1958 edition that presents approximately 4400 selected references to current occupational literature. Besides describing individual occupations, the book contains a bibliography of annotated, alphabetically listed books and pamphlets, many of which describe more than one occupation. Also apprenticeship, bibliographies; charts, posters, and visual aids; choosing a career, information about colleges

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and schools for vocational training; preparing for examinations; information about foreign study or employment; legislation and social security; scholarships; and occupations for the handicapped, etc.

Research Report

By John A. Fuzak. Paper, 95 pp., 7⅛ by 9⅞ in., illus., $1.50. American Technical Society, Chicago, Ill.

This research report is the product of a five-year study into the learning experiences of more than 500 junior high school students from the city of Lansing, Mich. The study was undertaken to examine the relationship between physical maturation and class performance in beginning industrial arts students.

Results of the study indicate that the degree of physical maturity attained by beginning shop students is often of primary importance in determining their ability to master the manipulative processes required for successful shopwork. It also provides a simple, accurate, and scientific method for teachers to measure physical maturation in beginning students. Complete information on its effective use, and the interpretation of results is included in this report.

Basic Electrical Power Distribution (2 Vols.)

By Anthony J. Pansini. Vol. 1 — paper, 122 pp., 6 by 9 in., illus.; Vol. 2 — paper, 121 pp., 6 by 9 in., illus., $2.40 per volume, $4.80 for both. John F. Rider Publisher, Inc., New York 11, N. Y.

These two volumes provide a solid background in the theory and operations involved in electrical power distribution used by utility companies. This text developed originally for a training course used by a well-known utility company to train its new personnel. Laymen and nontechnical personnel will understand it with ease. Coverage includes the entire journey of electrical energy from the generator to the consumer. The use of transformers, switches, insulators, capacitors, cables, and other necessary equipment are thoroughly explained. Numerical values for current and voltage, etc., are consistent with those found in the field.

Gas Tubes

Edited by A. Schure, Ph.D., Ed.D. Paper, 80 pp., 5½ by 8½ in., illus., $1.50. John F. Rider Publisher, Inc., New York, N. Y.

This text contains a thorough explanation of ionization of gases, and provides considerable detail of the physics of ionization, and the basics of gas conduction and arc discharge. Gaseous rectifiers are described fully, and the comparison with gaseous rectifiers are described fully, and the comparison with high vacuum rectifiers adds substantially to the already clear explanations. The text analyzes gaseous voltage regulators as well as the circuitry involved. Thyratron control tubes and other gaseous devices intended for similar functions are discussed in the text. Limiting himself to a specialized area in electronics, the author succeeds in attaining a well-rounded presentation of the subject at the intermediate level. He fulfills the aim of serving the junior laboratory engineer, the electronic technician and the student of communication or industrial electronics, all of whom will find this book exceptionally useful. Review questions are given at the end of each chapter.

This volume is No. 24 in the Electronic Technology Series edited by Dr. Schure.

Basic Pulses

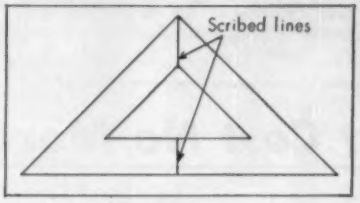
By Irving Gottlieb. Paper, 176 pp., 6 by 9 in., illus., $3.50. John F. Rider Publisher, Inc., New York, N. Y.

Pulses are used to a great extent in the electronic field. They find application in radar,

(Continued on next page)

DRAFTING TIPS

Drawing perpendiculars



Drawing perpendiculars to a line on a drawing that is not horizontal or vertical can be tricky. An easy and accurate method is to scribe a line perpendicular to the long edge of a triangle. The long edge can then be placed accurately on the already-drawn line, and a point marked to locate the perpendicular.

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NEW PUBLICATIONS

(Continued from previous page)

television, telemetry, computers, and industrial operations use pulses in many ways.

This book explains thoroughly of what pulses are composed, and explains shaping techniques, measurement, generation, and application. The book is very comprehensive in its coverage. The knowledges conveyed by this course can be valuable in all activities within the electronic art. The pictorial approach accompanied by only as much text as is deemed essential for maximum clarity not only makes this course understandable but it always is easy reading. The course is suitable for home study or classroom use.

Light

By Alexander Efron. Paper, 140 pp., 5½ by 8½ in., illus., $2.25. John F. Rider Publisher, Inc., New York, N. Y.

In days gone by it was sufficient for a person to have a casual knowledge of the physical sciences. The modern climate of scientific interest demands a deeper understanding of what is happening around us. Light is perhaps the most intimate of all phenomena known to man. In this book Dr. Efron does a magnificent job of making the subject of light and the numerous related phenomena comprehensive at the intermediate level. Without wasting any words, yet maintaining the utmost clarity throughout he covers the subject thoroughly. The book begins with a lucid treatment of the four concepts of the nature of light, corpuscular, wave, electromagnetic, and guantum.

The author's experience of long standing and high repute as an honors class teacher in high schools is evident in his writings. Other sections of the book deal with reflection, refraction, the visible and invisible spectrum, optical instruments and illumination. In all cases the presentation is exceptional. The spectrum chapter is illuminated with the use of color plates. Students of physics in schools or in industrial training programs will find this book of great value, as will the general reader who has a camera, or uses a microscope, or a telescope, or who is interested in color, color reproduction, and home or office lighting. A high light of the book is the way in which problems are worked out. Even the questions are graded to bring to light the progressing degree of understanding.

Television Servicing

By Walter H. Buchsbaum. Cloth, 289 pp., 6¼ by 9¼ in., illus., $5. Prentice-Hall, Inc., New York, N. Y.

This is the third edition of this book. It has been brought up to date fully. It consists of three parts, the first of which treats of the general theory of television, part two discusses the alignment installation, and part three is on trouble shooting.

1958 Handbook on Women Workers

Women's Bureau Bulletin No. 266, United States Department of Labor, Washington 25, D. C. Paper, 153 pp., 5⅞ by 9⅛ in., 45 cents.

Food and You

By Edmund S. Nasset. Paper, 166 pp., $1.25. Barnes & Noble, Inc., New York, N. Y.

This is a handbook presenting the basic information about food and diets and recommending definite habits which will promote health and strength. Included is a useful glossary and a series of tables on food composition calories, sample low-calory diets, desirable diets for men and women. The book will supplement any course in physiology and health.

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Business and Personal News

BORDEN PRODUCES RESINS IN NEW PLANT

Borden Chemical Company have announced the production of Epiphen modified novolac epoxy resins in a recently completed plant at Bainbridge, N. Y. Six resins currently are in production at Bainbridge and all are available in commercial quantities. They range in viscosity from 2000 cps to semi-solids.

Manufactured by Borden's Resins and Chemicals Department, the Epiphen epoxies can be room temperature or heat cured to yield excellent chemical and heat resistance. Heat distortion temperatures in excess of 500 deg. F. have been attained without fillers. Adhesion to both porous and nonporous materials is described as extremely good.

Application field tests show that formulations based on Epiphen resins are excellent for plastic tooling, coatings, structural glass cloth laminates, body solder kits, adhesives, and encapsulation.

BLACK & DECKER RECEIVES AWARD

In the final ratings by an Independent Board of Judges in the Eighteenth Annual Survey of "Financial World," national weekly magazine, The Black & Decker Manufacturing

(Continued on page 28A)

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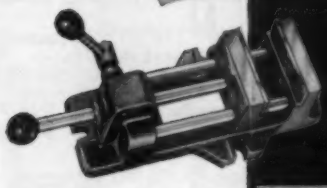

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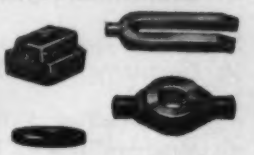

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BUSINESS & PERSONAL NEWS

(Continued from page 26A)

Company, Towson, Md., was judged for the third consecutive year as having the best annual report of the Portable Tool Industry. A bronze "Oscar-of-Industry" was presented to Robert D. Black, chairman of the Board and President of the Company at the annual awards banquet in the grand ballroom of the Hotel Astor in New York City on Monday evening, October 27, 1958.

SAMS ACQUIRES CONTROLLING INTEREST

Howard W. Sams & Co., Inc., Indianapolis, Ind., technical publishers, have acquired controlling interest in The Bobbs-Merrill Company of Indianapolis and New York, 120-year-old book publishing firm.

Howard W. Sams & Co., Inc., with its printing associate, The Waldemar Press, Inc., has grown from a 12-man group established in 1946 to its present position as the largest technical research and publishing firm in the electronics industry, serving every segment of the industry.

Bobbs-Merrill has always been a landmark in America's culture and an institution of the highest integrity. The company will retain its present identity, and will continue with its educational, legal, and trade book departments.

D. Laurance Chambers, associated with the company for over fifty years, becomes Chairman Emeritus and Col. Robert L. Moorhead becomes Honorary Secretary-Treasurer. Mr. Sams will be Chairman of the Board.

Descriptive Material

SAWS DESCRIBED IN NEW CATALOG

Delta Power Tool Division of Rockwell Manufacturing Company have issued a new 12-page catalog, which describes two Delta radial saws — the 10-in., portable and the all new "Super 900" 9-in. model.

Action photographs of 42 different woodworking operations that can be performed on a Delta radial saw, everything from crosscutting, ripping, and dadoing, to tongue and grooving, illustrate the new catalog.

Saws described in the catalog are used in metalworking, plastics, packaging and shipping, heavy and light construction, roofing and siding, building and lumber supply, woodworking and furniture making, and in industries in maintenance work, and in school shops.

Two pages of the catalog are devoted to accessories which include blades, molding cutters, sanding drums, routing bits, wire brushes, and drilling chucks. Complete specifications and catalog listings are also included.

(For further details encircle index code 0114)

COMBUSTION-TESTING AND AIR MEASUREMENT INSTRUMENTS

General Scientific Equipment Company have announced their Bulletin No. 138, which illustrates and describes a line of gas pressure manometers, oil flow graduates, sling psychrometers, air velocity meters, filter gauges, recording thermometers, carbon monoxide detectors, kits for testing gas heating equipment, CO^2 indicators, and pressure point testers. Booklet is available upon request.

(For further details encircle index code 0115)

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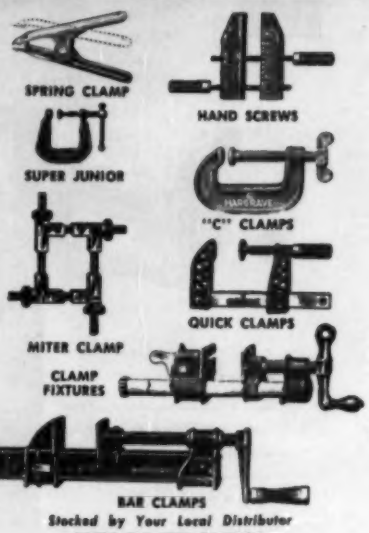

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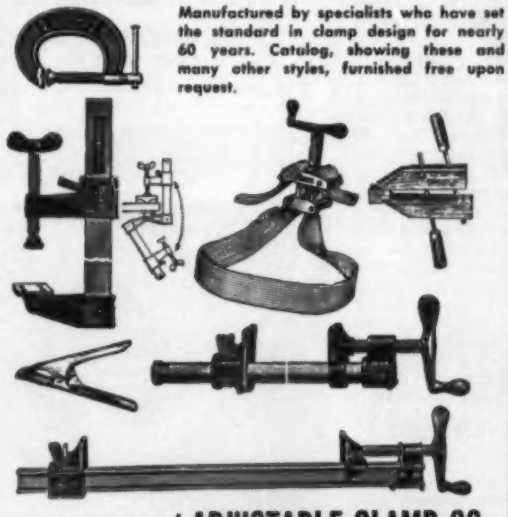

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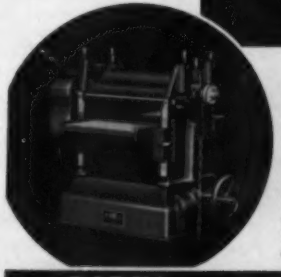

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Shop Equipment News

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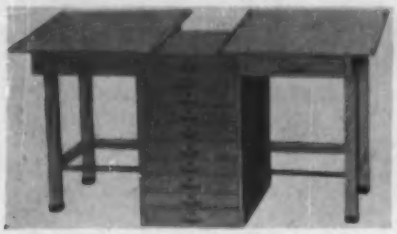
Stacor Equipment Company have broadened their Flex-Master Line of multi-student drawing units. The newest addition is a 12-drawer cabinet and drawing table combination.



Stacor 12-Drawer Cabinet and Drawing Table Combination

"DU 1200" consists of two wood-topped drawing boards, each with a drawer, flanking a ten-drawer steel cabinet. Drawers are sized to hold individual boards, tools, and other materials. Thus, convenient personal storage facilities for twelve students are provided in minimum space without sacrificing privacy and individual working freedom. Like all Flex-Master cabinets and drawing tables, the new combination set is designed to interlock with every other unit for extreme flexibility of arrangement and adjustment to special requirements.

Complete information about the Flex-Master line is obtainable.

(For further details encircle index code 0101)

NEW TUNGSTEN CARBIDE HAND SANDERS

Millers Falls Company announces the introduction of a new line of Hand Sanders, made with tungsten carbide lifetime abrasive. Initially, two models will be available: medium (80 grit) and fine (150 grit). They cut twice as fast as sandpaper and are ideal for use on wood, plastics, and composition materials.

These sanders are made by copper brazing tungsten carbide grits permanently to a steel shoe, forming an abrasive surface that lasts indefinitely. This shoe is mounted on a wood block 2¾ by 5½ in., which is curved for easy gripping. A ⅛-in. felt pad between the block and steel plate distributes pressure evenly for a smooth, fine finish.

New Tungsten Carbide Hand Sanders

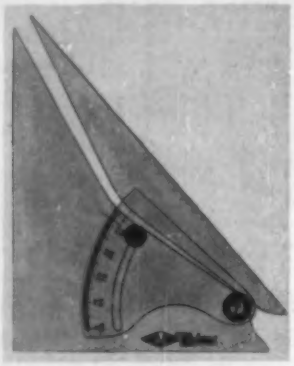
The sharp surface won't wrinkle, shred, or tear, and controlled grit spacing resists clogging, even when removing paint. On exceptionally gummy woods, cutting surface may be cleaned easily with a wire brush or solvent.

These sanders are extremely practical for both amateur and professional craftsmen.

(For further details encircle index code 0102)

FLUORESCENT ADJUSTABLE TRIANGLES

Alvin & Company, Inc., offers top quality professional fluorescent protractor triangles that provide for faster, more accurate work. The adjustable triangle is fabricated from clear optical grade Plexiglas which eliminates all distortions. Fluorescent acrylic triangles



Fluorescent Adjustable Triangles

embody all the qualities of clear acrylic. They reflect an orange tint and have the unique feature of illuminating an orange light from all edges. Beveled protractor edges eliminate any possibility of parallax lines. Material is highly ductile, rigid, and shatter resistant with a thickness of .100 of an inch. Triangles will not darken, discolor, decompose, or warp with repeated use.

Alvin's fluorescent adjustable triangles combine the functions of a protractor and a triangle. The right triangle permits drawing of accurate angles from 0° to 90° direct from the base line. The protractor element has two rows of die-sunk graduations: the outer row indicates angles from 0° to 45° from the base; the inner row indicates angles from 45° to 90° from the shorter base, and angles may be set to graduations of one-half degree with assured accuracy. The fulcrum point has an aluminum screw post to insure lasting firm movement. The adjustment arm is held firmly when adjusting to any angle by a knurled knob screw with a metal insert, which also serves as a handle for easy pickup and rapid manipulating.

Further information available.

(For further details encircle index code 0103)

NEW ALLIED KNIGHT STEREO ENSEMBLE

Allied Radio Corporation announces the release of the new Knight Stereo Ensemble consisting of the KN-734 Deluxe 34-Watt Stereo Amplifier and the KN-120 Deluxe Stereo Basic FM-AM Tuner. The music lover need only add two hi-fi speakers for three-dimensional broadcast reception. In addition, there is complete provision to accommodate stereo records, tapes, or other sources.

New Allied Knight Stereo Ensemble

The KN-734 amplifier may be used as a stereo amplifier delivering 17 watts from each of its two sections or as a 34-watt monaural amplifier. It features a low-impedance output jack for binaural headphone use and dual tone controls to provide independent setting for each of the two stereo speakers. Additional features include: adjustable input load for magnetic cartridges; d.c. current on preamplifier heater filaments; loudness control; and rumble and scratch filters. Specifications at 17 watts per channel are: frequency response, ±0.5 db, 30–20,000 cps. The KN-120 tuner features Dynamic Sideband Regulation, a novel circuit which controls incoming FM signals and reduces distortion caused by weak or overmodulated broadcast signals. Other features are an extra long illuminated 9½-in. tuning scale, two new-type EM84 cathode ray tuning indicators, dual flywheels, and individual factory sweep alignment. Sensitivity is 2.5 microvolts for 20 db quieting on FM, and 5 microvolts for a 20 db signal-to-noise ration on AM.

Color-styled in beige vinyl plastic, bonded to metal cases, with contrasting gold and smoky beige panels of solid extruded aluminum, the Knight Stereo Ensemble may be placed on table top, or bookshelf.

(For further details encircle index code 0104)

STEEL BAND-SAW BLADE COIL STOCK

The appointment of Boice-Crane Company, as distributors in the United States of EFCE brand celebrated Swedish steel band-saw blade coil stock, has been announced recently.

Precision type blades in 100-ft. and 400-ft. lengths, in six widths from 3/16 to 1 in., and

Steel Band Saw Blade Coil Stock

(Continued on page 32A)

CORRESPONDING CODE INDEX NUMBERS TO BE ENCIRCLED CAN BE FOUND ON THE CARDS IN THE READER'S SERVICE SECTION

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(For more information from advertisers, use the postcard on page 37A)

SHOP EQUIPMENT NEWS

(Continued from page 30A)

nine pitches from 3 to 24 teeth per inch, both raker and wavy set, are now being supplied. The line also includes ¼-, ⅜-, ½-, and ¾-in. skip tooth blades in 100- and 400-ft. coils.

Each 100-ft. coil is packed in a metal-reinforced carton fitted for easy side dispensing of blade without removing the coil itself. Apertures in the carton show the amount of remaining blades at all times. The reverse side carries handy tables on blade pitch and blade speeds for 35 ferrous and nonferrous materials in varying thicknesses.

Literature will be sent upon request.

(For further details encircle index code 0105)

FOOLPROOF SAW GUARD

The Brett-Guard Corporation have introduced their new Brett-Guard foolproof power saw guard. It is designed to give complete protection in the operation of any conventional table saw with blades of six to sixteen inches diameter. A transparent shield of shatter-resistant Plexiglas covers the saw allowing full vision and complete accuracy in a wide variety of operations. The guard is set into any of three operating positions in extension plates attached to the table top by a simple flick of the knob. It is capable of providing horizontal and vertical pressure and can be used as an overriding fence for angular work. The guard prevents physical contact with the blade and resists displacement while in use.

A special feature recently inaugurated is the nonfouling spring-loaded anti-kick back device built into the Plexiglas shield which increases operator protection and further protects against all possible injury to the operator. It is designed to dig into the stock in case of a *force back* and prevent harm to the operator.

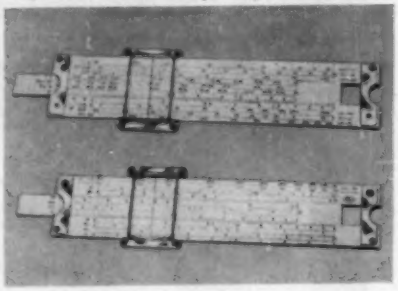
New Brett-Guard Safety Guard and Guide

(For further details encircle index code 0106)

THE POCKET VERSALOG SLIDE RULE

Frederick Post Company announces the development of a compact, highly efficient professional slide rule in shirt-pocket size. The Pocket Versalog weighs only 1½ oz., measures 6¾ in. long, contains 23 versatile scales, and is highly accurate for on-the-spot, rapid calculations.

The rule's construction is patterned after Post's 10-in. Versalog. Overlaid with snow-white celluloid on which the 23 scales are engine-divided in sharp, easy-to-read markings, each graduation is cut to hairline precision with accurate machine control. Furnished in a leather case with pocket clip, the Pocket Versalog is constructed of laminated bamboo. The rule resists warpage to a high degree, while natural sealed-in silica make the rule function more smoothly as the years go by without ever a need for lubricants.



The Pocket Versalog Slide Rule

Color coding of the trigonometric scales simplifies their use in conjunction with the C, D, and CI scales. Calculations involving trigonometric functions may be performed more easily with less chance of error by simply matching the color of the trigonometric scale being used with the same color of the corresponding C, D, or CI scale.

The same RI and R2 scales, patterned after the 10-in. Versalog, permit square root computations with far greater accuracy than with A and B scales. The log scales cover a range from 0.00005 to 0.999. Symmetrical arrangement of these two groups of scales permits greater facility in determining reciprocals and hyperbolic functions.

(For further details encircle index code 0107)

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Four new "package deals" of Di-Acro Precision Machines are now offered to *school shops only* at these low prices. Brake and Roller are Spartan models, designed especially for schools. Bender, Notcher and Shear are industry proven. Benches are heavy gauge steel.

Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Shear No. 4
Di-Acro Notcher
Di-Acro Bender No. 2
Bender Accessory Package
Bender Stand Machinery Stand
Reg. prices add up to $1535.50

Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Bender No. 2
Bender Accessory Package
Bender Stand Machinery Stand
Reg. prices add up to $885.50

Spartan Model 24 Roller
Spartan Model 24 Box and Pan Brake
Di-Acro Shear No. 4
Di-Acro Bender No. 1A
Bender Accessory Package
Machinery Stand
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Spartan Model 24 Roller
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TRIPOD TABLE FOR POWER TOOLS

Phillips & Buttorff Corporation have designed and have in use a versatile power tool table. The tripod table with a 12 by 12-in. slotted top that has a 360-deg. rotation and a height adjustment from 33¾ in., to 40 in., is made of hi-tensile cast iron, and occupies less than two square feet of floor space.

Tripod Table for Power Tools

Since their engineers and designers found the table so useful for holding small power tools and such as grinding wheels, vises, drill presses, and jig saws, the management decided to make the table available to other industrial design departments, home workshop enthusiasts, service stations, and plumbers.

The power tool table has met with enthusiastic response. The company has prepared a specification sheet which will be furnished upon written request.

Distribution is to be through hardware stores, hobby shops, and craftsman stores.

(For further details encircle index code 0108)

(Continued on page 34A)

Hotpack ELECTRIC CERAMIC KILNS

No. 7006

1. Eye level controls — pilot light. 2. Built-in pyrometer for visible accurate temperature indication. 3. Handles are cool to touch. 4. Control switch — low, medium, and high heat for even distribution. 5. Special insulation holds heat and prevents scorching of table top. 6. Maximum temperature 2050° F.

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Model No.	Interior Size	Shelves Furnished	Approx. Time	Price F.O.B. Phila.
7006	8"x 8"x 5½"	1	3 hrs.	$ 85.00
7004	8"x 8"x11"	2	4 hrs.	$115.00
7005	12"x12"x11"	2	3 hrs.	$250.00
7007	15"x15"x16½"	3	4 hrs.	$480.00
7009	12"x12"x 5½"	1	4 hrs.	$125.00

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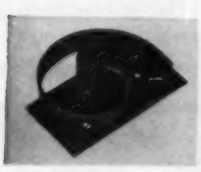

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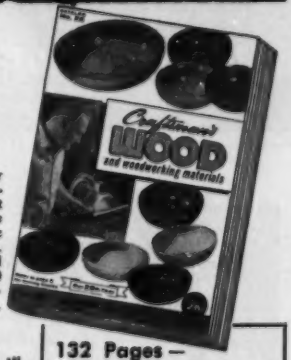

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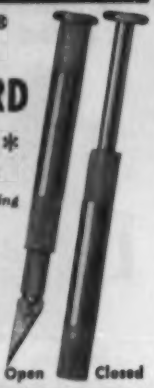

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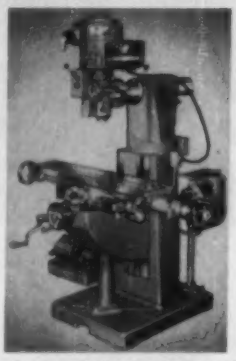
SHOP EQUIPMENT NEWS

(Continued from page 33A)

POWER FEED FOR SOUTH BEND VERTICAL MILLING MACHINE

The addition of Power Feeds to the table and quill of the South Bend Vertical Milling Machine has been announced by South Bend Lathe Works. These power feeds will greatly increase the efficiency and ease of operation of this precision machine.



South Bend Vertical Spindle Milling Machine with New Power Feed

The power feed is provided for the spindle by means of a hydraulically operated mechanism with an infinitely variable range of feeds from 0 to 25 in. per minute. A new rapid traverse control is also provided to permit positioning quill with utmost speed.

Power longitudinal feeds to the table are provided by an independent motor drive and lever operated quick change mechanism connected to the table by means of telescoping feed shafts. The quick change selective feed mechanism will provide a range of 30 feeds to the table from ¼ in. to 15 in. per minute. Feeds can be easily and positively selected by moving the plunger levers of the conveniently indexed quick change gear mechanism. The longitudinal feed gear box has precision cut steel gears and index plate for quick setting of selective levers. Another feature is the mechanical overload mechanism which is provided to prevent damage to the power feed if accidently overloaded.

(For further details encircle index code 0109)

KODAK UNIVERSAL CHANGER

A new slide changer that provides increased versatility and handling ease, with three popular Kodak slide projectors, has been introduced by Eastman Kodak Company.

The Kodak Universal Changer permits all three types of slide mounts — cardboard, glass, or metal — to be shown by the Kodak 300 and 500 Projectors. With a simple adapter the changer may be used with the Kodaslide Signet Projector, Model 2.

Built into the changer is a newly designed shutter which darkens the screen between slides; the slide doesn't "move" across the screen. The new molded trays used with the changer hold 36 slides in any combinations of the three types of mount.

Further information on prices of the Universal Changer plus one tray with a new Kodak 300 Projector, and with the Kodak 500 Projector, may be obtained by writing.

(For further details encircle index code 0110)

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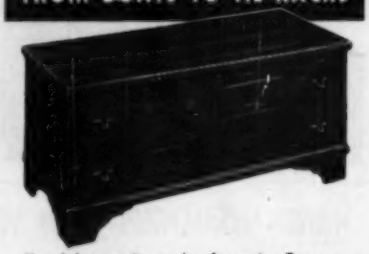

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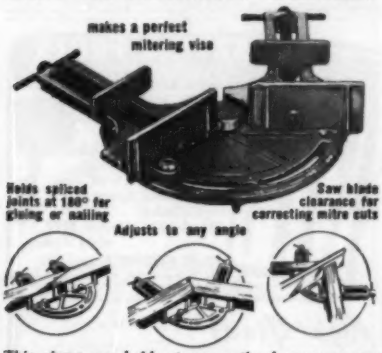
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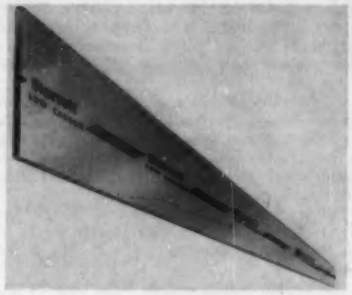
NEW STARRETT LOW CARBON FLAT STOCK

The L. S. Starrett Company have introduced a new low carbon precision ground flat stock of exceptionally high machinability. It offers the economy of a low carbon steel plus lower machining costs, easier and faster production, better finish, and longer cutting tool life.



New Starrett Low Carbon Flat Stock

Starrett No. 498 Low-Carbon Precision Ground Flat Stock has a machinability rating of 91 per cent against 72 per cent for most low carbon steels. It is available in 24-in. lengths in widths from ⅜ in. to 16 in., and in thicknesses from 1/16 in. to 2⅜ in. Each piece is identified along the full length with the words "Starrett Low Carbon." Each piece is individually packaged in a protective envelope.

An .18 carbon, fine-grained, silicon-killed steel of forging quality, it is precision ground to the same tolerances as Starrett tool steel ground flat stock. Ends are machined square; edges are ground parallel and square; thickness is accurate within .001 in. Because it is precision ground to accurate size, a wide variety of work having two flat, parallel sides can be produced by simply laying out and cutting to the required shape.

A bulletin giving sizes, specifications, suggested applications and heat-treating information is available on request.

(For further details encircle index code 0111)

PLASTIC PRESS HAS BUILT-IN HEATING UNIT

O'Neil-Irwin Mfg. Company have added a new Radiant Heater Panel with pivot mount-

New Di-Acro Plastic Press Model 18

(Continued on next page)

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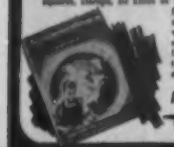

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SHOP EQUIPMENT NEWS

(Continued from previous page)

ing to the Model 18 Di-Acro Plastic Press to facilitate the forming of thermoplastic sheet materials such as acrylics, polystyrenes, vinyls, and butyrates.

The new Heater Panel will be standard equipment on all Model 18 Plastic Presses. It has a maximum heat temperature of 660 degrees Fahrenheit which is sufficient to provide a short heat cycle on all thermoplastic sheets.

The Heater Panel can be added to any Plastic Press already in use. The vacuum, blow, and stretch forming processes which can be performed with the Di-Acro Plastic Press are identical to the processes which the plastics industry is carrying on every day.

For information on the cost of the Di-Acro Plastic Press Model 18 with Heater Panel and all standard equipment, write to the manufacturer.

(For further details encircle index code 0112)

STERLING PERM-ALUM SQUEEZE-IN BOTTOM BOARDS

Sterling National Industries, Inc. (formerly Sterling Wheelbarrow Company), have developed another improved product for the foundry industry. This time it's *all aluminum squeeze-in bottom boards.*

These newly engineered boards are fabricated from high tensile aluminum which has been named Sterling Perm-Alum. This highly ductile alloy weighs about ⅓ as much as steel, while retaining its tensile strength up to 47,000 lb. psi. Sterling Perm-Alum bottom boards also provide complete resistance to corrosion.

After extensive squeeze, shakeout, and radiated heat foundry testing, Sterling Perm-Alum bottom boards remain torsionally rigid — no fracturing or cracking, even when molds are left on boards until cold.

While available in standard sizes, 10 by 10-in., to 18 by 20-in., Sterling Perm-Alum boards can be custom-built to meet your individual requirements. Perforations can also be provided. The boards are reinforced with welded aluminum battens and have rolled safety edges to protect the hands.

(For further details encircle index code 0113)

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